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DISEASES

OF

THE STOMACH

A TEXT-BOOK FOR PRACTITIONERS AND STUDENTS.

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BY

MAX EINHORN, M.D.

ADJUNCT PROFESSOR IN CLINICAL MEDICINE AT THE NEW YORK POST-GRADUATE MEDICAL SCHOOL AND HOSPITAL; VISITING PHYSICIAN TO THE GERMAN DISPENSARY.

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TO MY FRIEND AND TEACHER,

C. A. EWALD, M.D.,

PROFESSOR OF CLINICAL MEDICINE IN THE UNIVERSITY OF BERLIN,

THIS BOOK IS RESPECTFULLY DEDICATED.

PREFACE TO THE SECOND EDITION.

It is about a year now since my book on "Diseases of the Stomach" was published. In this short time the first edition has been exhausted and a reprint rendered necessary. It is quite natural that in so brief a period no radical changes were called for in the text. A revision, however, was undertaken and a few alterations and slight additions were made.

I trust that the second edition will be as favorably received by the medical profession as the first.

MAX EINHORN.

NEW YORK, October 25th, 1897.

PREFACE TO THE FIRST EDITION.

DURING the last twenty years our views in the field of diseases of the stomach have undergone great changes. W. Beaumont in this country laid the corner-stone of scientific research and experimental study on the functions of this organ in 1825. From that time on the science of gastric diseases remained in a state of quiescence until 1867, when Kussmaul methodically applied the stomach pump in the treatment of dilatation of the stomach. The real progress, however, began a few years later, when Leube made use of the stomach pump for diagnostic purposes. Ewald, Boas, Reichmann, Riegel, and others then instituted extensive studies of the gastric functions in health and disease. This second epoch in the study of digestive diseases, which had its inception in Germany, soon made itself felt in other countries, notably France, Russia, Austria, England, and America. In our country especially it seems that a very fruitful activity is developing in this direction. Among the older writers I would mention the names of Austin Flint, Delafield, Pepper, and Osler, all of whom contributed largely to our clinical knowledge in this branch of medicine. The newer researches were taken up here and further advanced by Charles G. Stockton, Francis P. Kinnicut, Allen A. Jones, D. D. Stewart, J. C. Hemmeter, and many other very active investigators. The progress achieved relates to a more profound knowledge of gastric affections—by examination of the functions—and to a more successful therapy, first by diet, secondly by the newer mechanical means of treatment (lavage, spray, electricity), and thirdly by surgical procedures. Our more extensive knowledge of diet and treatment is of advantage not only to the specialist, but to the general practitioner as well, and it is with the view of assisting the latter in the acquisition of all these advantages which have of late accrued that this treatise has been written. A series of articles on Diseases of the Stomach, which I contributed to the "Twentieth Century Practice of Medicine" has greatly facilitated my work. In this book the subject has been considered from a more practical standpoint, and special attention has been paid to diet and treatment. I trust that this work will aid in awakening a deeper interest in the study of diseases of the stomach among American physicians, and if this object be realized, I shall feel more than recompensed for the time spent in its preparation.

MAX EINHORN.

NEW YORK, June 15th, 1896.

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DISEASES OF THE STOMACH.

CHAPTER I.

ANATOMY AND PHYSIOLOGY.

ANATOMY.

THE stomach is a pyriform sac the longitudinal diameter of which is as a rule oblique in position. The larger part of the organ is situated higher up and more to the left than the smaller, which is directed to the right somewhat upward and sometimes backward. This smaller extremity terminates in the small intestine. The point at which the stomach communicates with the small intestine is called pylorus (*P*) and is recognizable on its outer surface by a furrow and on its inner surface by a protruding fold (valvula pylori). The communication between the œsophagus and the stomach is called the cardia (*C*) and is situated at the upper part. A straight line (*AB*) drawn in the direction of the œsophagus and prolonged through the stomach would cut off one-fourth or one-fifth of this organ to the left. This portion to the left is called the greater *cul-de-sac* (saccus cæcus) (*F*) or fundus. The volume of the stomach varies according to the condition of its contents. When filled its long diameter measures 26 to 31 cm., the transverse diameter being 8 to 10 cm. at the fundus and much less at the pylorus. Here it measures about 2.6 cm. When the stomach is filled the anterior wall turns somewhat upward and the posterior downward (a rotation of the organ takes place).

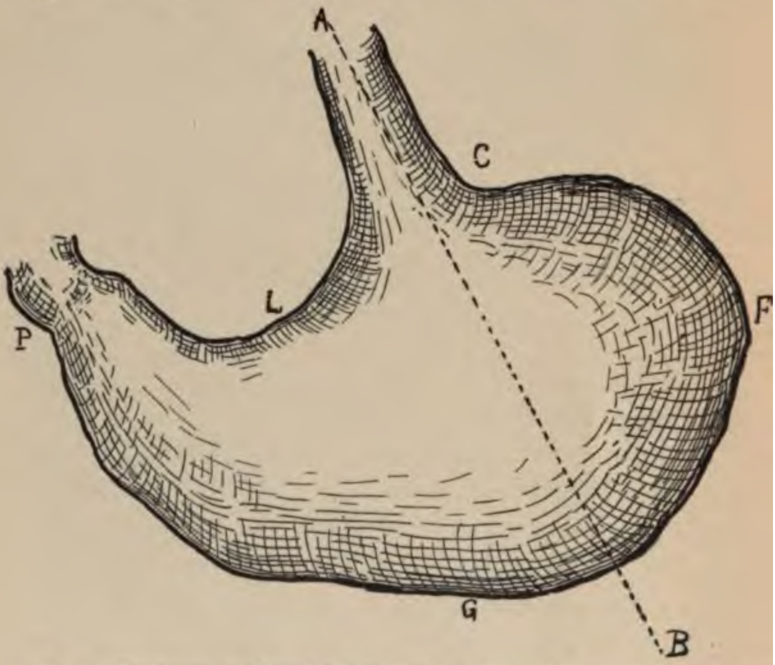

FIG. 1.—The Stomach. *C*, cardia; *P*, pylorus; *F*, fundus; *G*, greater curvature; *L*, lesser curvature.

Situation.

The stomach lies on the left side of the body, and only one-sixth of it is situated on the right side. This includes the pylorus and the adjacent parts which lie behind the liver (lobus Spigelii). The cardia is situated in the left parasternal line, somewhat above the ensiform process; the lesser curvature lies on the left side, close to the vertebral column and runs downward and parallel with it. The greater curvature extends from the base of the gall bladder and the liver into the left hypochondriac region in which the whole of the fundus is found.

Blood-Vessels.

The blood-vessels enter the stomach at its upper and lower borders and thus divide the surface of the stomach into two equal parts. These lines mark the superior and inferior margins of the stomach, the upper and lower curvature, or the lesser and greater curvature.

The Relations of the Stomach to Neighboring Organs.

The left segment of the stomach is in contact with the diaphragm above, and to the left with the spleen and the left kidney. The lesser curvature and the adjacent part of the organ are in relation with the pancreas, and the splenic artery and vein. The greater curvature and a portion of the front wall as well as the pylorus touch the liver and also the transverse colon.

Structure of the Stomach.

The stomach has four coats, the serous, muscular, areolar or submucous, and mucous. The serous coat is derived from the peritoneum and forms a thin, smooth, transparent and elastic membrane. It closely covers the entire viscus excepting along its two curvatures. Here the attachment is looser, leaving space for the larger blood-vessels.

The muscular coat is composed of plain muscular tissue, forming three sets of fibres disposed in layers—namely, the longitudinal, the circular, and oblique fibres. The outermost layer is the longitudinal one, then follows the circular, and the innermost is the oblique. The latter is very incomplete, and is a continuation of the circular fibres of the gullet. These fibres descend obliquely from the cardiac orifice upon the anterior and posterior surfaces of the stomach, and after spreading out from one another, they run in the direction of the circular fibres and terminate at the greater curvature.

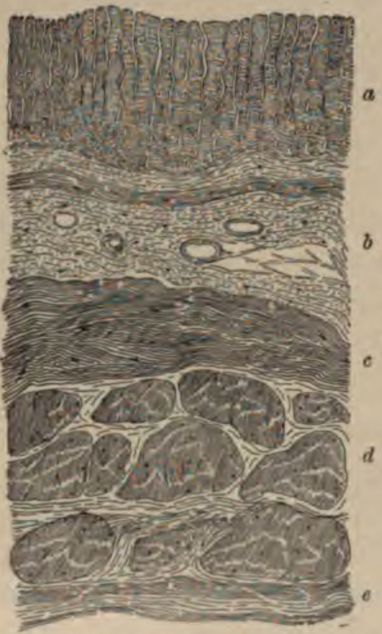

FIG. 2.—A Vertical Section of the Stomach. *a*, Mucosa; *b*, submucosa; *c*, *d*, muscularis; *e*, serosa. × 60.

The submucous coat connects the muscular and mucous coats and consists of areolar tissue. It is the seat of division and passage of the blood-vessels.

The mucous membrane is a smooth, soft, rather pulpy membrane which has a somewhat pink hue.

It is thickest in the pyloric region and thinnest at the fundus.

The mucous membrane constitutes the glandular layer of the organ. The glands, which number about five millions, are tubular in form and are arranged perpendicularly to the surface; at their base and around them are fibrous tissue and lymphoid cells.

The glands are composed of the following parts: (1) The mouth; (2) the neck, which is the thinnest part; (3) the body, which is much thicker, and (4) the base.

Several tubules (two to five) very frequently end in one mouth. The dots that are seen on the surface of the mucosa consist of the openings of the glands. The whole inner surface of the stomach is covered by columnar epithelium, which extends for a variable distance into the mouths of the glands.

The glands are divided into two kinds:

1. Cardiac or fundus glands. These fill the greater part of the stomach and are characterized by the two following features: The mouth of the gland is short as compared with the length of the gland itself. They

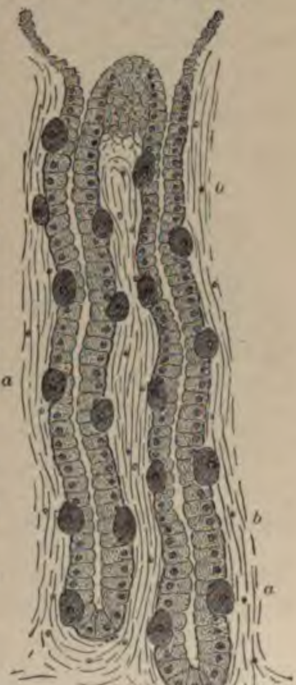

FIG. 3.—A Cardiac Gland. *a*, Parietal cells; *b*, principal cells.

contain parietal or oxyntic cells, which are closely arranged in the neck of the glands. They are recognizable by being of a more or less cuboid shape and having a dark granular appearance. They are stained quite deeply with the aniline dyes. The other cells of the glands are called the principal cells, and are somewhat smaller in shape and not so dark as the parietal cells.

2. The pyloric glands. The mouth of the gland is quite long as compared with the tube itself. The body of the gland consists almost entirely of the principal cells. No parietal cells are to be found here, although some cells also occur which become darkly stained with osmic acid. Nussbaum considered them similar to the parietal cells of the cardiac glands. They are usually called the Nussbaum cells.

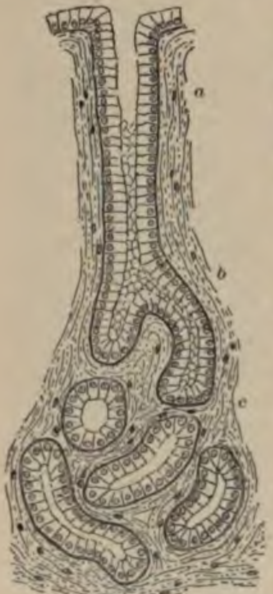

FIG. 4.—A Pyloric Gland. *a*, Mouth; *b*, neck; *c*, fundus.

Besides these specific glands there are a number of mucous glands in the neighborhood of the pylorus.

Heidenhain,[1] Kupffer,[2] Sachs,[3] and Stoehr[4] have greatly contributed to our knowledge of the histology of the gastric mucosa. According to these writers, the principal cells generate the pepsin and the rennet ferments, whereas the parietal or oxyntic cells are imbued with the faculty of secreting hydrochloric acid.

---

[1] Heidenhain: Archiv für mikrosk. Anat., vol. 6, 1870.

[2] Kupffer: "Epithel und Drüsen des menschlichen Magens," München, 1883.

[3] Sachs: Archiv f. experimentelle Patholog., vols. 22 and 24.

[4] Stoehr: Archiv f. mikrosk. Anat., vol. 20.

Blood-Vessels, Lymphatics, and Nerves of the Stomach.

The arteries of the stomach originate from the cœliac axis, the left coronary artery being a direct branch of this vessel, and the right a branch of the hepatic artery. These supply the smaller curvature and form the superior ventricular arch. The greater curvature is supplied by the right inferior coronary artery, being a branch of the hepatic artery, and by the left inferior coronary artery, which is a branch of the splenic artery; they both form the inferior ventricular arch. All these vessels reach the stomach between the folds of the peritoneum. After ramifying between the several coats and supplying them with blood (especially giving off a number of capillaries to the muscular coat), and after dividing into very small vessels in the submucous areolar tunic, their ultimate arterial branches enter the mucous membrane and ramifying freely pass between the tubuli, where they form a plexus of fine capillaries upon the walls of the tubules and also around the mouths of the glands.

The veins arise from the capillary network and pursue an almost straight course through the mucous membrane between the glands. After piercing the muscularis mucosæ and forming a wide plexus in the submucous tissue, they return the residual blood into the splenic and superior mesenteric veins and also directly into the portal vein.

The lymphatics of the gastric mucosa extend, as first shown by Lovén, directly to the surface of the mucosa. They form a dense network of lacunar spaces situated between and among the gland tubuli, which, as well as the blood-vessels in many parts, they enclose with sinus-like dilatations. Near the surface of the membrane, the lymph is collected into vessels which form loops or possess dilated extremities. These vessels are less superficial than the blood capillaries, although the lacunar spaces extend as far as the basement membrane of the surface.

The nerves originate from the abdominal part of the vagus, forming the interior gastric plexus at the cardia. The vagus here extends over the whole anterior surface of the fundus. The right branch of the vagus supplies with only one-third of its fibres the stomach wall, especially the posterior wall, whereas two-thirds supply the other abdominal organs. The branches of the sympathetic nerve coming from the cœliac plexus enter into many ramifications with the vagus. These nerves, with a number of small ganglia, form a network in the submucosa.

PHYSIOLOGY.

The stomach forms a part of the digestive tract, and in order to understand its functions thoroughly, it will be best to give a short review of the entire process of digestion. By the term "digestion" are understood all processes which serve to convert the various food-stuffs into such a condition that they become fit for entrance into the circulation. These changes are effected by means of ferments, which replace the Bunsen flame of the chemist in the laboratory of the living organism. The ferments are produced by living cells, and possess certain properties in the way of effecting chemical changes when in contact with certain substances. All these changes can ultimately be explained as an hydration of anhydrides—*i.e.*, the substances developed by their presence contain more water than the primary substances.

All ferments possess the six following qualities:

1. They are of organic nature.
2. They act only in the presence of water.
3. The total amount of the formed products contains more hydrogen and oxygen (in the relation of water) than the original substance.
4. They decompose peroxide of hydrogen.
5. They act best at temperatures varying between 30° and 60° C.
6. Each ferment possesses a specific action, and one and the same substance may develop different products when in contact with different ferments.

The ferments are divided into two classes:

1. Formed ferments: those whose active principle cannot be separated from the original cell in which they are generated and is dependent on the life of their mother substance (yeast cells).
2. Unformed ferments: those which can be separated from their original soil without losing their specific action.

Most of the ferments that exist in the living organism are unformed (ptyalin, pepsin, rennet, trypsin, etc.).

Thus far all attempts to isolate ferments in a chemically pure state have been unsuccessful. We only know that they are organic bodies whose structure is similar to that of the proteids.

In the mouth the food first comes in contact with the saliva by the act of chewing. This secretion consists of the products of the salivary and mucous glands of the mouth. It is of alkaline reaction, low specific gravity (1.002–1.009), contains epithelia, mucus, ptyalin, albumin, and some salts. It also contains traces of potassium rhodanate (CNKS). After being lubricated by the saliva, the food passes through the pharynx and œsophagus into the stomach. The ptyalin, which is characterized by converting starch into maltose or sugar, begins its action upon the food already in the mouth, but the principal work is done during the first period of digestion within the stomach.

The Gastric Juice.

Spallanzani[1] and Réaumur were the first to make experimental studies upon the gastric juice. They recognized its property of digesting meat and of exerting an antifermentative action. Prout in 1824 discovered hydrochloric acid in the gastric juice. These experiments have been greatly furthered and advanced in this country by Beaumont,[2] who at about the same time made a series of investigations upon the well-known Canadian St. Martin with his gastric fistula. Many of the facts discovered by Beaumont form the basis of our knowledge of the physiology of the stomach; as, for instance, his observations on the movements of the stomach. Blondlot[1] first established a gastric fistula in animals for experimental purposes. Bidder and Schmidt[2] have conclusively shown that the acid of the gastric juice is hydrochloric acid, while Schwann in 1836 discovered the pepsin ferment. The nature of the acid of the gastric juice has been the subject of much controversy even during late years. Thus Winter and Hayem[3] disputed the formation of hydrochloric acid within the gastric glands. They assert that while the glands produce an organic acid, this is changed into an inorganic by the presence of salt (sodium chloride) within the stomach. This theory, however, is incorrect, as it is well known that the stomach will furnish a secretion containing free hydrochloric acid even when no food or other substance containing sodium chloride has been ingested.

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[1] Spallanzani: "Versuche über das Verdauungsgeschäft." Abhandlung vi.

[2] Beaumont: "Experiments and Observations of the Gastric Juice and the Physiology of Digestion," Combe's edition, 1833.

The gastric juice is a clear, colorless fluid of an acid reaction and a specific gravity of 1.002–1.003. The quantity secreted in twenty-four hours is not exactly known. It is estimated by some to be about three pints. The principal constitutents of the gastric juice are: (1) Hydrochloric acid; (2) pepsin; (3) rennet.

The degree of acidity varies from 0.1 to 0.2 per cent. Both ferments, pepsin and rennet, when first secreted are inactive bodies and called respectively pepsinogen and rennet-zymogen, but coming in contact with the acid become converted into active pepsin and rennet. Besides these three substances, the gastric juice contains water, inorganic salts, and some proteid matters.

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[1] Blondlot: "Traité analytique de la digestion," Paris, 1843.
[2] Schmidt: Liebig's Annalen, xcii., 1854.
[3] Winter and Hayem: "Du Chimisme Stomachale," Paris, 1891.

The greatest difficulty in explaining the production of gastric juice was encountered in the circumstance that an inorganic acid should be secreted by the blood, which is a strongly alkaline solution. Maly,[1] however, gave the following explanation: Some liquids with alkaline reaction may contain acid salts; thus in the blood there exist disodic orthophosphate and monosodic orthophosphate (Na_2HPO_4 and NaH_2PO_4), together with distinctly alkaline salts. When such a solution is placed into a dialyzer immersed in distilled water the acid principle passes into the latter. Thus within the dialyzer there is an alkaline and outside an acid liquid. Maly compares the stomach and the kidneys to a dialyzer, and explains in this way the secretion of acid fluids from the kidneys and from the stomach. The details of the formation of hydrochloric acid may be given as follows: If Na_2HPO_4 is brought together with calcium chloride ($CaCl_2$), there is formed triphosphate of calcium, sodium chloride, and free hydrochloric acid according to the following formula: $2Na_2HPO_4 + 3CaCl_2 = Ca_3(PO_4)_2 + 4NaCl + 2HCl$.

This theory, although very ingenious, does not suffice to explain the entire process of gastric secretion. For there is no reason why the hydrochloric acid should not be secreted in other organs than the stomach, the blood coming into contact with many other glandular apparatuses. Besides, this theory does not explain why the secretion should not go on all the time in the stomach. Here as elsewhere we are forced to accept a specific action of the cells which cannot be explained by simply physical or chemical laws. We know that there are cells imbued with certain specific actions that are unexplainable by chemical formulæ.

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[1] Maly: "Untersuchungen über die Mittel zur Säurebildung im Organismus." Zeitschrift für physiologische Chemie, i., p. 174.

Gastric Digestion.

The principal part played by gastric digestion consists in the conversion of albuminates into the more soluble forms of propeptones and peptones, which are the result of the combined action of hydrochloric acid and pepsin. The rennet ferment curdles milk. The gastric juice is also endowed with the property of converting cane sugar into grape sugar, and gelatin into a soluble form (a peptone) which no longer coagulates. Besides this, a small percentage of fat is split into fatty acids.

The work accomplished by the stomach in the act of digestion must also be ascribed to the active and passive movements that take place in this organ, in consequence of which certain physical changes are effected in the ingested food. Each particle of food is brought into more intimate contact with the stom-
alls by these movements than would otherwise
e. The food as a whole becomes more lique-
sses, as chyme, through the pylorus into

the small intestines. The pylorus is said to control the entrance of the more liquid chyme into the duodenum. It opens and closes at certain intervals. We are as yet not able to give a full explanation for this seemingly elective action of the pylorus, nor do we exactly know at what intervals the pylorus opens. It is only known that at certain times after certain meals (about two hours after a small meal, six to seven hours after a large meal) the stomach is completely empty.

Some of the substances contained in liquefied chyme are absorbed through the stomach wall, such as sugar, salts, peptone, perhaps propeptones; the rest passes into the small intestine, and is subjected to the action of several secretions that combine there in order to further change it and make it fit for absorption.

Intestinal Digestion.

Although it is not my intention to give a detailed description of the process of intestinal digestion, it might still be useful briefly to discuss the further fate of the chyme. On the entrance of the chyme into the duodenum, it is subjected to the influence of the bile and pancreatic juice, which are there poured out and also to that of the intestinal secretion. All these secretions have a more or less alkaline reaction, and through their admixture with the chyme its acidity becomes less and less, until at length, at about the middle of the small intestines, the reaction becomes alkaline and continues so as far as the ileo-cæcal valve.

Of the bile we know that it has a strongly alkaline reaction and that it is able to emulsify fats. It also possesses antifermentative and slightly purgative properties.

The importance of the liver, however, cannot be judged from the influence which the bile exerts upon the digestive economy. "To regard the liver in this light," says L. Brunton,[1] "is just about as rational as to think that an Atlantic steamer has been built for the express purpose of throwing out from its sides the two jets which are formed by the waste water from the engines. The condensed steam may be utilized and so may the bile, but the condensation of steam is not the main object of an Atlantic steamer, nor is the secretion of bile a chief function of the liver."

All the blood from the stomach and intestines must pass through the portal vein before it can reach the general circulation. The hepatic tissue acts the part of a prudent porter at a gate, and turns back or destroys dangerous intruders. The liver serves, briefly, the four following purposes:

1. It is a kind of store-room of the organism, many substances taken up by the digestive process being kept there until their final use in the system. Thus many of the peptones and the greatest part of sugar are stored up in the liver as glycogen.

2. It excludes from the circulation several poisonous matters or destroys them; curare, for instance, which is so poisonous when injected into the blood, proves quite innocuous when taken by the mouth, the reason being that the liver does not pass this poisonous matter into the circulation but retains it, and finally excretes it through the bile. The liver guards the

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[1] T. L. Brunton: "Disorders of Digestion," London, 1893.

organism from the entrance of many detrimental substances.

3. It has also been proven lately that the liver is the main place where urea is formed.

4. The secretion of bile.

If now we return to the subject of intestinal digestion, we shall have to speak, firstly, of the pancreatic secretion, which is the most energetic and general in its action of all the digestive juices. It unites in itself the action of the saliva and the gastric juice besides having properties of its own. By means of its trypsin ferment, it converts albuminous bodies into peptones, but in a much shorter time than the gastric juice. If the action of the pancreatic juice upon albumin goes on for a longer period of time, then leucin, tyrosin, and several other derivatives, as asparaginic acid and hypoxanthin[1] are formed. Its diastatic ferment converts starch into sugar and acts in the same way as ptyalin, only more intensely. The third ferment it contains is steapsin, which emulsifies fats and tends to split them up into fatty acids and glycerin. The chemical formula for this process may be expressed as follows:

$$\overset{\text{Tristearin} \quad \text{Steapsin}}{C_3H_5(C_{17}H_{34}-COOH)_3} + \overset{\text{Water}}{3HO_2} = \overset{\text{Glycerin}}{C_3H_5(OH_3)} + \overset{\text{Stearinic acid}}{C_{17}H_{35}-COOH)_3}$$

The pancreatic juice acts in an alkaline medium, and the chyme after its entrance into the small intestine is rendered alkaline by the conjoint action of the bile, the pancreatic juice itself, and the enteric juice. The latter, the juice secreted by the small intestines, is known to dissolve only fibrin, but it is yet uncertain whether it contains a diastatic ferment.

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[1] See C. A. Ewald: "Die Lehre von der Verdauung," p. 176, Berlin, 1890.

The substances that have been left undigested in the stomach are quickly changed into soluble products in the small intestines (chyle) and taken up by the lymphatics and the venous blood current. The principal part of absorption is performed in the small intestines. The chyle has a slightly alkaline reaction until it enters the large intestines, where it again is rendered acid by some of the products of decomposition generated in the lower part of the small intestines. In their passage along the large intestine the undigested materials assume a more solid consistence in consequence of the absorption of the fluid portion, and become gradually changed into fæces and are expelled by the rectum. Several products of proteid decomposition are formed in the large bowels. One of these, discovered by Brieger,[1] is called skatol (C_9H_9N), to which the offensive smell of the fæces is principally due.

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[1] Brieger: "Ueber die flüchtigen Bestandtheile der menschlichen Excremente." Journal für prakt. Chemie, 1877.

CHAPTER II.

METHODS OF EXAMINATION.

THE INTERROGATION OF THE PATIENT.

THE examination of the patient begins with the narration of the course and symptoms of his trouble past and present. The history must state how long the trouble has existed, whether it began gradually or suddenly; and the supposed cause of the ailment. We have to inquire whether the disease has constantly progressed or whether it has been interrupted by free intermissions. We have further to inquire whether the symptoms have always been the same or whether they have changed in character since the beginning of the trouble. It is important to know whether there has been loss of flesh and whether this has been continually increasing. We should inquire also as to the condition of the bowels, whether there is constipation or diarrhœa or both interchangeably.

Present condition: The patient should be requested to describe the symptoms he complains of. As this, however, is not done very accurately by the patient himself, we shall find it frequently necessary to cross-examine him. The important points to which attention should be directed in our cross-examination are as follows:

The Appetite.—Is there loss of appetite? Does the appetite come when the patient begins to eat? Does the appetite disappear when the patient has taken a few mouthfuls of food, or is there a *perfect* aversion for food? The loss of appetite is designated by the word "anorexia." If there is a perversion of appetite—that is, appetite only for unusual substances—we speak of "parorexia." If the appetite is increased—that is, if the patient becomes hungry soon after a meal—we speak of "bulimia." If the patient takes large quantities of food, much more than normal, but at his regular meals, we speak of "polyphagia." If there is no feeling of satiety no matter how much the patient takes, then we speak of "acoria."

Thirst. — Inquire whether the patient becomes thirsty more frequently than usual or whether there is no desire whatever for drinks.

Taste.—Inquire whether the taste in the mouth is all right or whether it is bitter, sour, or sticky, and if there is such abnormal taste, at what time it is mostly experienced.

Deglutition.—Does the food pass into the stomach without difficulty or not? If not, state whether the difficulty is experienced only after ingestion of solid substances or also after fluids.

Abnormal Sensations.—How do you feel after meals? Do you feel bloated? Do you experience a feeling of fulness or pressure in your gastric region? Do you feel sleepy or giddy, and if so for how long a time?

Belching.—Do you belch much and if so, when? Does it occur only after a meal or also in the morning when the stomach is empty? Do you belch so much that it inconveniences you in society, or that it keeps you from your business? Is the belching connected with some bad smell, or is the gas that comes up odorless, inoffensive?

Regurgitation.—Does the food come up into your mouth? If so, state whether it is sour or not, and whether this frequently occurs and how long after meals. If the food that comes up is spit out we speak of "regurgitation," but if it is chewed and swallowed we speak of "rumination." If only some sour fluid comes up, then we speak of "water brash."

Pyrosis.—Do you experience a burning sensation at the pit of your stomach, and when? Is it half an hour after a meal, or is it three hours or so afterward? How long does this sensation last?

Pains.—Pains when experienced at the pit of the stomach are called cardialgia; if in the gastric region, gastralgia. Pains are the most frequent complaints met with in all kinds of digestive troubles. They may be of a severe nature so that the patient is obliged to stay in bed, or they may be of only a light character so as merely to inconvenience the sufferer. When does the pain appear? Does it come right after eating or does it occur an hour or two or three afterward? Does it exist when the stomach is empty and is it appeased by the ingestion of food? How long does the pain last? Does it remain all the time, or only a short while, or does it come and go independently of the food taken? If it follows the ingestion of food, is it more intense after partaking of certain coarse, indigestible aliments? Is the pain circumscribed and felt only at one spot or does it extend all over the gastric region? Does it radiate to the back and shoulder blades? Does the pain come on suddenly or slowly, and does it gradually increase?

Nausea.—Is the nauseous feeling present only in the morning or after each meal, or does it appear after certain foods (as meats)?

Vomiting.—Inquire whether the patient vomits; if so, how often this occurs, whether daily or only once in two or three weeks. Does the vomiting occur soon after a meal or at other times? Does it occur in the middle of the night? Do you vomit large quantities? If so, of what do they consist? Is it only food or is it simply an acid watery fluid? Does the vomited matter contain food from previous days? Does it contain much bile? Does it smell when it is vomited or has it an acid, disagreeable taste? Was there ever any blood in it? Fresh blood looks red, while digested blood that has been in the stomach a much longer time has a coffee-brown color. Is the act of vomiting connected with much exertion or does it take place easily? Do pains exist before vomiting and disappear after its cessation?

Bowels.—Inquire whether the bowels move every day or not. Are they constipated? Is the patient always obliged to take some aperient and what is the nature of the aperient? Is there diarrhœa? State how many movements a day and the character of the stools, whether they are very watery or whether there is some admixture of mucus or blood. Does the diarrhœa appear after each meal? Does it alternate with periods of constipation?

METHODS OF PHYSICAL EXAMINATION.

The examination of the patient should always begin with a thorough examination of his chest, for very often persons complaining of digestive troubles really suffer from diseases of other organs; while sometimes affections of the stomach exist in connection with other diseases of organic nature. After having ascertained the condition of the thoracic organs a special examination of the abdominal organs should then be instituted.

Inspection.

The general appearance of the patient very often affords us an idea of the nature of his illness, especially with regard to its severity, whether we have to deal with some serious trouble or with an affection of only a functional character. The emaciated and sallow look of a patient suffering from cancer and the well-nourished rosy face of a patient with a neurotic disturbance of his digestion are striking examples of what can be made out by a mere glance.

We must inspect first the oral cavity and inform ourselves about the condition of the teeth, gums, tongue, uvula, and pharynx. Defective and carious teeth sometimes give origin to gastric disorders.

In olden times the tongue was regarded as a mirror of the stomach, so that every gastric affection was judged by the appearance of the tongue. Although nowadays we know that there are conditions in which the stomach is diseased and still the tongue has a normal appearance, and *vice versa* conditions where the stomach is in no way affected and still the tongue heavily coated, it is nevertheless true that many gastric affections go hand-in-hand with changes in the appearance of the tongue. The tongue may at times be thickly furred or may appear very shiny and gray; sometimes it may show indentations around its margin, sometimes again it may look red and dry like leather.

In the pharynx we sometimes discover catarrhal conditions or swollen follicles.

The uvula is sometimes very much elongated and may in this way give cause to some reflex digestive troubles.

The inspection of the neck will sometimes disclose a swelling to the left of the larynx, which increases after partaking of food and may be due to a diverticulum of the œsophagus.

The inspection of the abdomen should never be neglected. The contours of the stomach are at times visible in patients with thin abdominal walls, and especially if the stomach is either extraordinarily large or displaced downward. Osler[1] not long ago laid much stress upon this simple method of examination, and ascertained that in many instances we can make the diagnosis of a dilated stomach by mere inspection. I can corroborate Osler's view, as I have had occasion in several instances of making a diagnosis of ectasia ventriculi by the mere visible outlines of the stomach. Tumors may sometimes be seen and recognized as such. Their position will already give us a clew as to what organ they belong. By attentive inspection we sometimes notice peristaltic waves passing from left to right over a large area in the upper part of the abdomen, which are caused by the muscular action of the stomach. If these waves are intense in character and persist for some length of time, then we have to deal with the condition called "peristaltic restlessness" of the stomach. Smaller peristaltic waves may be seen occasionally in the lower part of the abdomen and be due to a peristaltic movement of the small intestine.

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[1] W. Osler: "Lectures on Diagnosis of Abdominal Tumors." New York Medical Journal, 1894.

Palpation.

Palpation is one of the best and most important methods of examination. A good clinician is as a rule an artist in palpation. The best way to practise this method is as follows: The patient should assume an easy, comfortable, recumbent position; the physician stands to the right of the patient and places his right hand, which should not be cold, flat upon the abdomen. Palpation is first practised with the tips of the fingers without exerting much pressure. The entire abdomen may be examined in this manner by moving the hand from the left lower border of the ribs down to the left iliac region, going then to the right iliac region and then up to the margin of the ribs on the right side. If the patient contracts his abdominal walls too much, it is best to divert his attention from the examination by conversing with him upon other topics. Very often then the abdominal walls will become more relaxed and palpation is rendered possible. Pay attention to any resistance you encounter, also the sensitiveness or tenderness of the different regions. By this method of light and tender palpation we may discover a tumor and determine its position, size, consistence, as well as its mobility. In examining the lower part of the abdomen we also palpate the inguinal region and ascertain whether there are swollen glands or not.

To determine the position of the abdominal organs it is always advisable to make use of both hands. The left hand should push the organ or region to be examined toward the palpating right hand. The colon is very often felt somewhat below the navel running transversely across the abdomen as a ribbon-like body. The pulsating aorta, lying in the median line of the body somewhat above the navel, is also frequently very clearly felt. The spleen, if enlarged or displaced, can be distinctly explored especially during a deep inspiration, the left hand of the examiner pressing the left hypochondriac region downward and the right hand palpating just below the margin of the left ribs. The kidneys are accessible to palpation if they are displaced downward or are movable. In examining the right kidney the left hand of the physician is placed behind the right lumbar region of the patient, pressing this part somewhat upward, while his right hand lies flat upon the right hypochondriac region, the patient being requested to take a deep breath. In examining the left kidney the position of the hand is reversed. The liver can be palpated when enlarged or when it is prolapsed.

Palpation with Exertion of Pressure.—This can be done with one or two fingers. The object of this method of examination is to test the degree of sensitiveness, tenderness, or painfulness of different regions of the abdomen. In this manner the circumscribed painful area of an existing ulcer may be discovered or the diffused tenderness of the whole gastric region that is often met with in inflammatory conditions of this organ. Boas[1] has devised an algesimeter for the purpose of indicating at what degree of pressure pain is experienced by the patient. It is provided with a scale giving the different pressures in weights; thus a pressure amounting to 5 or 10 kgm. in weight causes pain only in catarrhal conditions, whereas in ulcer of the stomach a weight of only half a kilogram produces intense pain. As a rule, I think we can dispense with this instrument. The amount of pressure exerted and felt by the hand is thoroughly sufficient to an experienced practitioner.

Percussion.

In percussing the stomach it is best to use finger percussion and to practise this procedure without much force. The object of this method of examination is to determine if possible the situation of the stomach. This organ, being as a rule partly filled with air, gives a tympanitic sound on percussion. It is, however, quite difficult to ascertain its exact size, as the large intestine may be filled with gas and also give the same tympanitic sound. For this reason Piorry[2] suggested filling the stomach with water before resorting to percussion. The stomach when filled in this manner gives a dull sound, which can then be more easily differentiated from the tympanitic sound of the colon. The

[1] J. Boas: "Diagnostik und Therapie der Magenkrankheiten," i., p. 75, Leipzig, 1894.

[2] Piorry: "Die mittelbare Percussion," Würzburg, 1828.

best way to examine the patient, according to Piorry, is to let him drink large quantities of water (about one litre) and to examine him when standing. The same method was frequently used afterward by Penzoldt.[1] Dehio,[2] who is also a strong advocate of this method, gives the water, however, in fractional quantities. The patient first drinks one-fourth litre of water and is then examined; he now takes the same amount, after which a second examination is made, and so on until the whole litre of water has been ingested. The area of dulness that is found on the abdominal wall is marked each time with a lead pencil. It is necessary to note whether the lower limit of this area has extended considerably farther down after the addition of each portion of water. In dilated stomachs the lower limit of this area will be found quite far down below the navel, whereas in normal stomachs the lower limit will usually be above it. According to Boas[3] the Dehio method furnishes a test of the tonicity of the gastric muscle. Boas asserts that in all cases where the lower limit of the dull area descends quickly after the further addition of the water there exists a kind of weakness or atony of the stomach.

As the results obtained by the above methods of percussion are not always sufficient and clear, several other means have been introduced which permit of a better recognition of the size of the stomach. The first, and so to speak clinical method, applied for this purpose is that devised by Frerichs[1] and consists in filling the stomach with carbonic-acid gas. It is done in the following way: The patient first takes 2 gm. of sodium bicarbonate in a half-glassful of water, then 2 gm. of tartaric acid also dissolved in the same quantity of water. The sodium bicarbonate coming in contact with the tartaric acid in the stomach gives rise to the development of carbonic-acid gas, which distends the organ. The contours of the stomach are now sometimes visible through the abdominal wall. If this is not the case percussion is now applied in order to map out the tympanitic area. This method can certainly be very frequently applied and will prove useful to the practitioner. It has, however, two disadvantages, one being that the quantity of gas is sometimes insufficient, and the other that it might be too large and give the patient a feeling of pressure in the stomach. In order to overcome these difficulties, Runeberg[2] first made use of a tube and a rubber bulb attachment that allowed the forcing of air into the stomach. Here the quantity of air can be easily regulated, the stomach examined in different states of distention, and afterward the air removed through the tube. This is the method of examination most commonly applied and in daily use.

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[1] Penzoldt: "Die Magenerweiterung," Erlangen, 1877.

[2] Dehio: "Zur physikalischen Diagnostik der mechanischen Insufficienz des Magens." Verhandl. des VII. Congresses f. innere Medicin, 1888.

[3] J. Boas: *Loc. cit.*, p. 85.

Auscultatory Percussion.

Auscultation by means of the stethoscope to the sounds produced by percussion has been practised by several observers, and recently warmly recommended by W. Pepper.[1] The patient holds the bulb of the stethoscope and moves it about while the physician percusses and maps out the abdominal organs.

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[1] Frerichs: Cited from H. v. Ziemssen, "Klin. Vorträge," 1883, No. 12, p. 13.

[2] Runeberg: "Ueber künstliche Aufblähung des Magens und des Dickdarms durch Einpumpen von Luft." Deutsches Archiv f. klin. Medicin, vol. 34, p. 460.

Sounds of the Stomach.

The Splashing Sound (*Clapotage*).

Whenever the stomach is filled partly with liquid and partly with gas it is possible to produce a splashing sound by striking the abdominal wall in the gastric region. This sound is distinctly audible at a short distance from the patient. Bouchard[2] made an extensive study of this splashing sound and considered it a sign of great diagnostic value in dilatation of the stomach. Nowadays we do not attach so much importance to the splashing sound *per se.* Dr. A. Rose[3] and myself have recently examined a hundred cases for the existence of this symptom and found it present in many persons not troubled in any way with digestive disturbances. The importance of the splashing sound, in my opinion, is that wherever it is present or can be produced, it allows us to ascertain the position of the stomach. In dilated stomachs this sound can be produced over a very large area of the abdominal wall, extending sometimes far down to the pubes.

Another point of importance seems to me to be the ease with which the splashing sound can be repeatedly produced. In cases of gastric dilatation and when the walls of the stomach are relaxed, even light tapping of the abdomen will always give rise to this sound. In normal conditions a splashing sound can sometimes be produced by striking the abdomen with the hand, but on repeating this procedure at once we will, as a rule, fail to produce it, as the stomach then contracts more or less, and it is necessary to wait quite a while until it has become relaxed before this sound can be again evoked.

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[1] W. Pepper: "The Diagnosis and Treatment of Dilatation of the Stomach," Medical Record, May 9th, 1896.

[2] Bouchard: Gaz. hebdomadaire de Médecine et de Chirurgie, 1884.

[3] A. Rose: "What is the Significance of the Splashing Sound of the Stomach?" New York Medical Journal, June 15th, 1895.

On examining the patient in the fasting condition the existence of the splashing sound is of value in showing that the stomach is not empty and hence abnormal. This, however, is not a reliable sign and I perfectly agree with Debove and Rémond[1] that sometimes, although rarely, the stomach may be found empty notwithstanding a splashing sound. Moreover, the absence of this phenomenon in the fasting condition does not by any means warrant the conclusion that the organ is empty. In many instances I was able to persuade myself that the stomach contained considerable quantities of food notwithstanding the absence of the splashing sound.

1. *Deglutition Sounds.*

The deglutition sounds were first described by Kronecker and Meltzer.[2] When drinking there is at times a sound to be heard simultaneously with the act of deglutition which is termed the first deglutition sound. More frequently a second sound is noted about seven seconds after the act of deglutition. Both sounds can be heard at the ensiform process either by placing the ear at that spot or by means of a stethoscope. As a rule only the second sound is perceptible. If the first sound is present, the second sound may also appear or at times may be absent. The presence of these deglutition sounds permits us in some measure to judge about the permeability of the cardia, and their main diagnostic value consists in demonstrating their absence, for then we are entitled to presume that the ingested liquid has not reached the stomach, but has remained in the œsophagus above the cardia. This is most often the case in strictures of the cardia, although occasionally this condition might be caused by a deficiency in the peristaltic motion of the œsophagus.

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[1] Debove et Rémond: "Traité des maladies de l'estomac," Paris.

[2] S. J. Meltzer: "Schluckgeräusche im Scrobiculus Cordis und ihre physiologische Bedeutung." Centralbl. f. die medicin. Wissensch., 1883, No. 1.

2. When the patient is drinking we can hear, by putting our ear to the abdominal wall corresponding to the gastric region, a kind of dripping sound, arising from the passing down of the fluid along the gastric wall. By mapping out exactly the spots over which the sounds can be heard while the patient is drinking we may at times be able to determine the contour and size of the stomach and form an idea whether the organ is enlarged or not.

3. O. Rosenbach[1] has suggested that the size of the stomach may be ascertained by giving the patient some water to drink and then blowing in some air by

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[1] O. Rosenbach: "Der Mechanismus und die Diagnose der Mageninsufficienz." Volkmann's "Samml. klin. Vorträge," 1878, No. 153.

means of a stomach tube. As soon as the end of the tube reaches the level of the water and air is blown in, a bubbling sound arises, which can be heard by placing the ear over the corresponding part of the abdominal wall, and the exact site marked out. As soon as the end of the tube is above the level of the water one can hear only the air striking the stomach wall, but unaccompanied with the bubbling sounds. By alternately raising and lowering the tube the height of the level of the fluid can be approximately determined.

4. The succussion sound. This sound was first described and utilized for diagnostic purposes by Hippocrates. The method consists in shaking the patient and listening. If the stomach is considerably enlarged and contains liquid and gas, splashing sounds are produced and can be heard at quite a distance from the patient. Such sounds also occur under other circumstances if the patients change their position, for instance, when turning from one side to another in bed, and give rise to considerable annoyance.

5. Gurgling sounds may be heard when the stomach, which does not contain any liquid but some air or gas, suddenly contracts. Thus every one is acquainted by personal experience with the sound generated in the stomach when one is very hungry. As the Germans say: "The stomach growls."

6. Respiratory sounds. Sounds arising synchronously with inspiration. These are heard especially in cases of gastric dilatation or of gastroptosis, or where the stomach occupies a vertical position, particularly in women who wear corsets. The sound may assume two characters, according to its mode of pro-

duction: One sound is produced during the act of inspiration by the gliding of the abdominal wall over the stomach when distended with gas. It is similar to the sound that is produced by the cello, and may perhaps be explained by reason of the gas being compressed and forming a resounding surface which is set into vibration by the movements of the abdominal wall. The second sound is caused by the rise and fall of liquid during the act of respiration. It has a somewhat splashing or squirting character. These sounds are very frequently met with and especially heard in ladies' society.

7. Sizzling sounds. These can be heard only on direct auscultation, and are produced by gas forming quickly in the stomach. They are normally found after the introduction into the stomach of bicarbonate of soda and tartaric acid, carbonic-acid gas being set free and giving rise to these sounds. Pathologically they are developed spontaneously and are a positive sign of fermentation going on in the stomach and consequently of stagnation of food.

8. Ringing sounds. These have been described by Laker[1] in a case of dilatation of the stomach. They are synchronous with the heart sounds and can be heard at quite a distance from the patient.

GASTROSCOPY.

The object of this method of examination is to look into the stomach and to ascertain the condition of the gastric mucosa. This method was inaugurated by Mikulicz[1] in 1881. The gastroscope is similar in shape and construction to the cystoscope, but much larger in size.[2] This method of examination has not, however, come into practice, and will hardly ever prove of much value; the chief reason being that a stiff metal tube has to be inserted into the stomach, which is hard to manage and causes great discomfort to the patient. As in all cases in which we have to deal with cancer or with other grave lesions of the stomach, there is always suspicion of an ulcer, this means of examination would not only be inconvenient, but also dangerous on account of the risk of perforation.

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[1] Laker: "Ueber ein rhytmisches Klangphänomen des Magens." Wiener med. Presse, 1889, Nos. 43 and 44.

GASTRODIAPHANY, OR TRANSILLUMINATION OF THE STOMACH.

The method of transilluminating living tissues was first applied by Cazenave in 1845. Milliot[3] in 1867 tried to transilluminate the stomach of animals, and used for that purpose a narrow glass tube in which there were two thin platinum wires connected with the electrodes of a Middeldorpf's apparatus. In 1889 I[4] succeeded in transilluminating the stomach of human beings by means of a soft-rubber tube at one end of which is fastened an Edison lamp by means of a small metal mounting. From here conducting wires run to the battery. At some distance from the rubber tube there is a current interrupter. I have called this apparatus the gastrodiaphane and the method of transilluminating the stomach, gastrodiaphany.

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[1] Mikulicz: "Ueber Gastroskopie und Œsophagoskopie." Wiener med. Presse, 1881, No. 45.

[2] Remark: Recently Th. Rosenheim, of Berlin, has constructed a new œsophagoscope and gastroscope. For details see "Ueber die Besichtigung der Cardia nebst Bemerkungen über Gastroskopie." Deutsche med. Wochenschr., 1895, No. 45.

[3] Milliot: Schmidt's Jahrbücher, Bd. 136, p. 143.

[4] Max Einhorn: "Die Gastrodiaphanie." New Yorker med. Monatsschrift, November, 1889. "On Gastrodiaphany." New York Medical Journal, December 3d, 1892. The Journal of the American Medical Association, 1893.

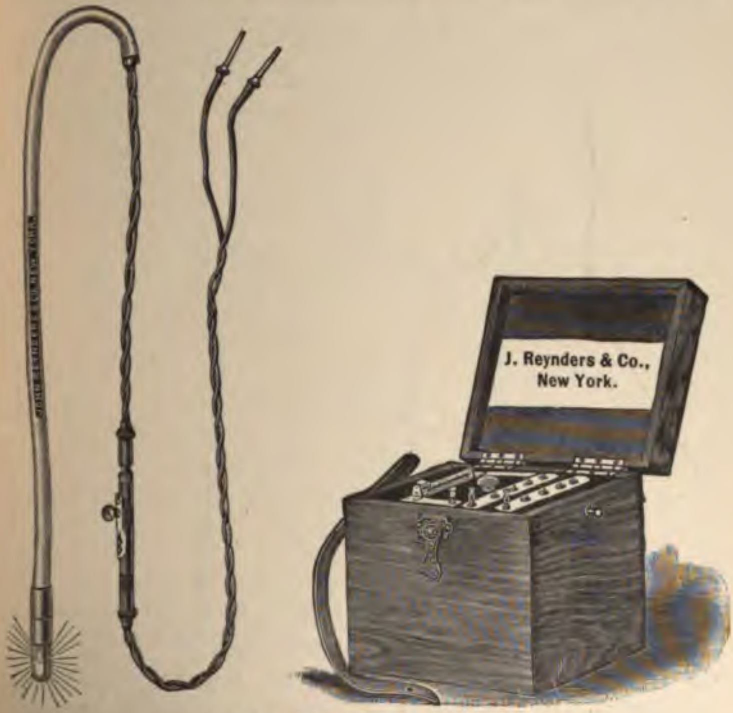

Fig. 5.—The Gastrodiaphane (Einhorn).

The aims of gastrodiaphany are: 1. To ascertain exact position and the size of the stomach. 2. To ize tumors or thickenings of the front wall of omach by their lack of translucency. Of late many investigators have busied themselves with this method of examination: Heryng and Reichmann,[1] Renvers,[2] Pariser,[3] Stewart, Ewald, Kuttner and Jacobson,[4] Martius and Meltzing,[5] Stockton, Friedenwald,[6] M. Manges,[7] and many others, and all have come to about the same conclusion as I have. Meltzing especially has written a very extensive and elaborate

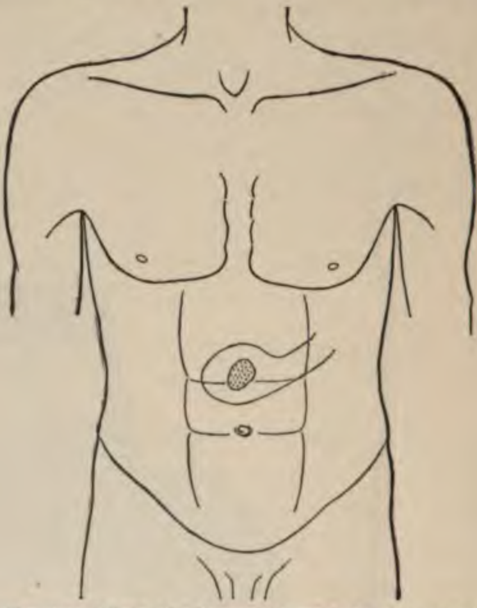

FIG. 6.—Transilluminated Zone of a Normal Stomach (M. S.). The dotted area in the centre shows the spot which was more luminous, being nearer to the lamp.

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[1] Heryng und Reichmann: Therap. Monatshefte, 1892.

[2] Renvers: Ver. f. innere Medicin, April 4th, 1892.

[3] Pariser: Berl. klin. Wochenschr., 1892, No. 32.

[4] Kuttner and Jacobsohn: Berl. klin. Wochenschr., 1893, No. 39.

[5] Meltzing: Zeitschr. f. klin. Medicin, 1895.

[6] J. Friedenwald: "Electric Illumination of the Stomach." Maryland Med. Journ., Jan. 20th, 1894.

[7] M. Manges: "The Value of the Modern Diagnostic Methods in Diseases of the Stomach." Medical Record, February 2d, 1895.

paper on gastrodiaphany and has tried to determine the normal position of the stomach by this means.

Method of Examination.—The patient, in a fasting condition, drinks one to two glassfuls of water. The apparatus, lubricated with glycerin or simply moistened in water, is then inserted into the stomach and connected with the battery. The examination is made in a perfectly dark room, either in the standing or recumbent position of the patient. The stomach transmits the electric light through the abdominal walls, and it thus becomes visible as a red zone at that place of the abdomen which corresponds the position of the stomach. In case the gastric front wall is occupied by a tumor, the latter will not transmit the light and

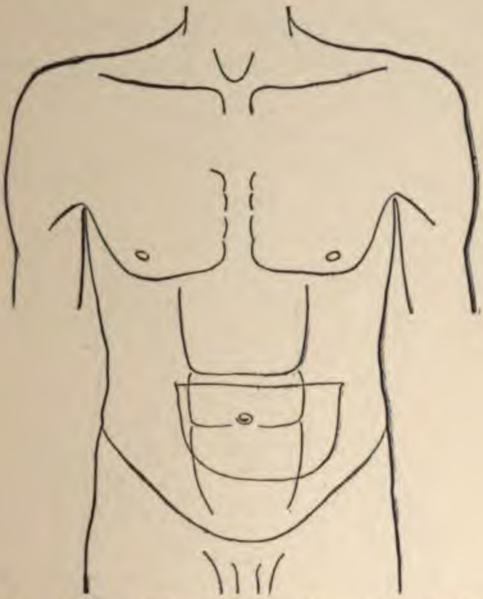

FIG. 7.—Transilluminated Zone of a Dilated Stomach (patient Wm. U.).

will be recognizable as a shady spot within the red zone of the transilluminated organ.

The accompanying illustrations obtained from patients whose stomachs have been transilluminated by the gastrodiaphane in different conditions explain themselves.

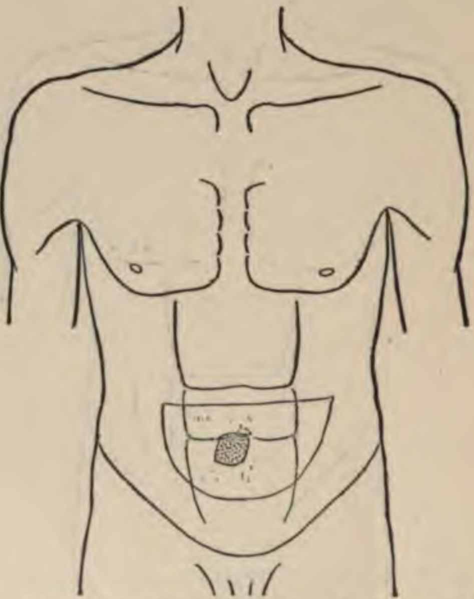

FIG. 8.—Transilluminated Zone of a Dilated Stomach (patient H. O.). The dotted area in the centre shows the spot which was more luminous, being nearer to the lamp.

Roentgen Rays.

Whether the Roentgen rays will be of material aid in the examination of the stomach, is quite difficult to state at the present time. As we have just seen, the gastrodiaphane enables us to recognize the shape and situation of the stomach and occasionally also tumors favorably situated for this procedure. Whether the X-rays of Roentgen will do more, further investigations will have to demonstrate.

EXAMINATION OF THE FUNCTIONS OF THE STOMACH.

Secretory Function.

Ewald and Boas[1] have studied the normal condition of gastric secretion in man. According to their observations, as soon as food enters the stomach, this organ begins to secrete its specific juice and continues to do so until the food has passed into the intestine. During the last period, however, the secretion is but

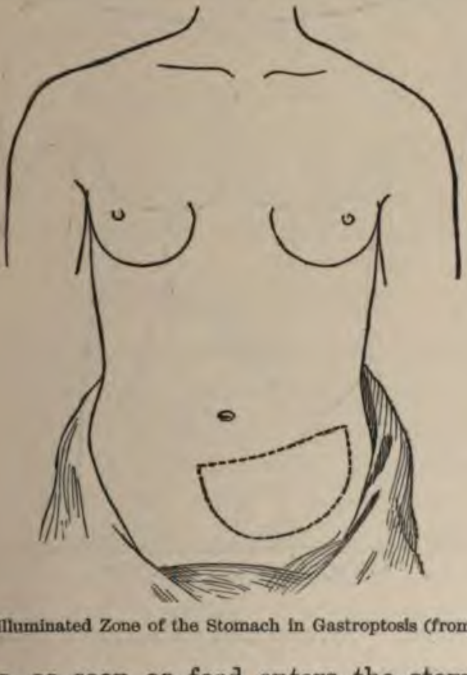

FIG. 9.—Transilluminated Zone of the Stomach in Gastroptosis (from Mrs. P. F.).

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[1] Ewald and Boas: Virchow's Archiv, vol. 101, p. 325.

very slight. That is the reason why examinations of the gastric contents reveal different results if made at various periods after partaking of food. In order to be able to judge in an exact manner whether the gastric secretion is normal or not, we must always make the examination under equal conditions, that is, after a certain meal. Several test meals have been proposed for this purpose.

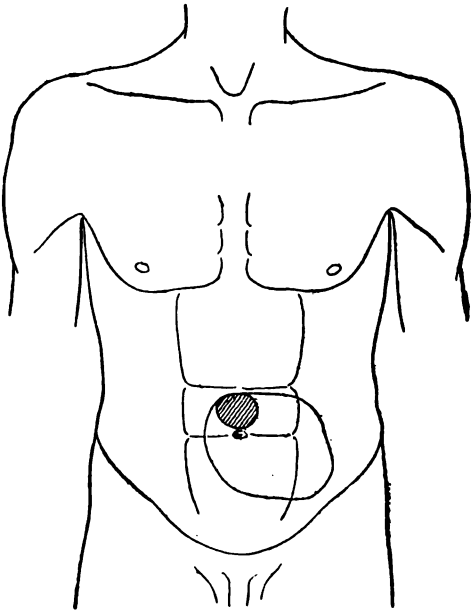

FIG. 10.—Result of Gastrodiaphany in a Patient with Carcinoma of Stomach. Dark area represents situation of tumor.

1. Leube-Riegel's Test Dinner.

The oldest form of test meal is the test dinner of Leube and Riegel. This consists of a large plate of soup (about 400 c.c.), a large portion of meat (beefsteak or something of that kind), some potatoes, and a roll. The time for examination is about three to four hours after the partaking of this meal.

2. *The Test Breakfast of Ewald and Boas.*

This is taken in the morning in a fasting condition and consists of one to two rolls (35–70 gm.) and one cup of tea or water (300–400 c.c.). Time for examination, about one hour after the meal.

3. *Germain Sée's Test Meal.*

This consists of 60–80 gm. of scraped meat and 100–150 gm. of white bread. Examination takes place two hours after the ingestion of the food.

4. *Klemperer's Test Meal.*

This consists of one pint of milk and two rolls. Examination takes place two hours afterward.

The two test meals that are mostly in use are the Leube-Riegel's test dinner and Ewald-Boas' test breakfast. In 1888 I[1] made a comparative study of the results obtained three to four hours after the test dinner, and those derived in the same cases one hour after Ewald's test breakfast. In some persons I was able to find free hydrochloric acid after the test breakfast, but not after the test dinner. Besides, the degree of acidity was more constant in the same individual after the test breakfast than after the dinner. Moreover, we are able to recognize some remnants of food from the previous day much more easily after the test breakfast than after the test dinner. As the test breakfast consists only of water and rolls, any other particles of food found in the gastric contents, as for instance meat, asparagus, would indicate that these substances have been left there from a previous meal. The test dinner being quite a complicated meal, does not allow us to recognize this so clearly, and it is necessary to examine the patient again in a fasting condition in case there is suspicion that the motor function of the stomach is impaired. These advantages have also been recognized by other authors, and nowadays almost all agree in preferring the test breakfast to the other test meals.

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[1] Max Einhorn: "Probemittagbrod oder Probefrühstück." Berl. klin. Wochenschr., 1888, No. 32.

The stomach contents may be obtained for purpose of examination by the following methods:

By means of the soft-rubber tube and either aspiration or expression. In using the tube it is best to have one with several openings at the lower end and to attach a small glass tube about three to five inches in length to the upper end (see Fig. 11). The tube is first immersed in a pitcher of warm water. The patient is provided with a bib or towel around his neck and sits on a chair, holding a wide-mouthed bottle in his left hand, near his chest; the physician takes the tube from the pitcher, places the glass end piece into the bottle, tells the patient to open his mouth, and inserts the tube, pushing it forward into the pharynx. (The physician need not insert his finger into the mouth of the patient.) The patient is now told to swallow once or twice, and the tube is rapidly pushed with the right hand into the stomach (about 44–45 cm.).

In using aspiration, one can either attach a Politzer bulb over the glass piece (Ewald) or Boas' aspirator, which consists of a rubber bulb having two soft-rubber ends provided with a clamp (see Fig. 12). The bulb is first compressed and then released, and in this way aspiration is secured and the bulb fills itself with the gastric contents.

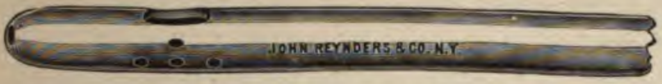

FIG. 11.—Ewald's Stomach Tube.

Ewald-Boas' expression method: The expression method consists in having the patient exert pressure upon his stomach by means of his abdominal muscles. This is best done by telling the patient first to inspire deeply and then to compress his abdominal walls in the same manner as during defecation. The pressure exerted in this way upon the gastric contents expels them through the tube into the bottle. This expression method is now almost exclusively practised every-

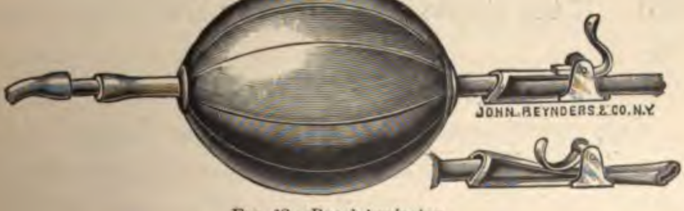

FIG. 12.—Boas' Aspirator.

where. It is the easiest and best way of obtaining the gastric contents.

Before removing the tube, it is necessary to occlude the glass opening with a finger of the right hand and to withdraw the instrument quickly from the stomach. (By closing the opening we avoid the return of some of the food particles contained within the tube into the œsophagus or pharynx; the tube is then emptied into the bottle containing the stomach contents.)

The ingesta obtained in the above-described way one to one and a half hours after the test breakfast are then filtered, and the filtrate is subjected to the following tests: 1. Reaction. 2. Hydrochloric acid. 3. Lactic acid. 4. Acidity. 5. Propeptone. 6. Peptone. 7. Pepsin. 8. Rennet ferment. 9. Dextrin. 10. Erythrodextrin. 11. Achroödextrin. 12. Maltose.

EXAMINATION OF THE INGESTA.

1. The Reaction

Is determined by means of litmus paper (blue and red). If the filtrate is acid it turns blue litmus paper red.

2. Hydrochloric Acid.

Many coloring matters undergo some change when brought together with even weak solutions of free hydrochloric acid. Methyl violet (weak one-per-cent. solution) turns blue; fuchsin is slightly discolored; tropæolin (saturated solution) turns from yellow to dark red-brown; benzo-purpurin turns from intense red to light red; Congo red (one-per-cent. solution) or Congo paper turns from red to dark blue. Of all these colors, I think Congo red is the most reliable one. As organic acids when present in considerable quantity may also give these color changes, it is of great importance to have another reaction for hydrochloric acid which the organic acids do not show.

Günzburg's Phloroglucin-Vanillin Test.—Günzburg[1] first taught us such a test with his phloroglucin-vanillin solution. This solution contains two parts phloroglucin, one part vanillin, and thirty parts alcohol. The test is made in the following manner: One drop of the filtrate is put on a porcelain dish. A drop of the phloroglucin-vanillin solution is added and well mixed with a glass rod. The porcelain dish is now heated over a spirit lamp and the fluid allowed to evaporate slowly. The presence of even small quantities of hydrochloric acid gives rise to a beautiful cherry-red color. If there be only traces of free hydrochloric acid, the margin of the examined spot turns cherry red.

Boas'[2] *Resorcin Sugar Test.*—The solution consists of resorcin 5.0, sach. albi 3.0, alcohol ad 100. The test is made exactly in the same way as with the phloroglucin-vanillin solution. The hydrochloric acid is recognized by giving a cherry-red color with the Boas reagent. This test is also very reliable, but, as I[3] have shown, less sensitive than the Günzburg reaction.

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[1] Günzburg: "Neue Methode zum Nachweis freier Salzsäure im Mageninhalt." Centralblatt f. klin. Medicin, 1887, No. 40.

[2] J. Boas: "Ein neues Reagens für den Nachweis freier Salzsäure im Mageninhalt." Centralbl. f. klin. Medicin, 1888, No. 45.

[3] Max Einhorn: "Die neueren Methoden der Magenuntersuchung." New Yorker medicinische Monatschrift, März, 1889.

3. *Lactic Acid.*

Uffelmann's Test.—The best test for lactic acid is made with the Uffelmann[1] solution, which has always to be freshly prepared before use. It consists of a two-per-cent. carbolic-acid solution in water, to which is added a drop of sesquichloride of iron. This test solution has an amethyst-blue color. Place about 2 c.c. of this Uffelmann solution in a test tube, and add a few drops of the filtrate. The presence of lactic acid brings on a canary-yellow color; the presence of fatty acids produces an ashy-gray color, whereas inorganic acids decolorize the blue color of the Uffelmann solution.

As some phosphates are liable to give the same reaction with the Uffelmann solution as lactic acid, and as these salts are very often present in the gastric contents, the surest way to discover the presence of lactic acid in the filtrate is the following: 5 or 10 c.c. of the filtrate are well shaken for quite a while in a test tube with a double quantity of ether. Then the tube is allowed to stand a few minutes until the ether has separated from the watery solution. Pour the ethereal portion into another test tube, which is placed in a glass of hot water, so as to allow its contents to evaporate. After evaporation has taken place, only a few drops remain in the test tube. Add 1 to 2 c.c. of distilled water and test for lactic acid with the Uffelmann solution. If a canary-yellow color now arises, the presence of lactic acid is positively shown.

Instead of evaporating the ether Fleischer[2] recommends testing the poured off ethereal extract directly with the Uffelmann solution; the presence of lactic acid gives the canary-yellow color above described.

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[1] Uffelmann: Deutsches Archiv f. klin. Med., vol. 26, p. 431.

[2] Fleischer: "Milchsäurenachweis im directen Aether." Cited from Penzoldt: Deutsch. Arch. f. klin. Medicin, Bd. li., p. 544.

Boas' Procedure for the Qualitative Determination of Lactic Acid.—The principle of this method consists in the fact that when solutions of lactic acid are treated and heated with oxidizable substances, a splitting of these occurs into acetaldehyde and formic acid, according to the following formula:

$$\underset{\text{Lactic acid}}{CH_3 - CH\,(OH) - COOH} = \underset{\text{Acetaldehyde}}{CH_3 - CHO} - \underset{\text{Formic acid.}}{CHOOH.}$$

The method of procedure is as follows: Take 10–20 c.c. of the filtrate and evaporate in a porcelain dish over the water-bath to a syrupy consistence. (If hydrochloric acid was present, then the addition of barium carbonate during the evaporation is necessary.) Add a few drops of phosphoric acid, expel the carbonic acid by boiling, and after cooling, extract with small portions of ether (two or three times, 50 c.c. each). After stirring for half an hour pour off the clear layer of ether. The ether is now evaporated; the residue, taken up with 45 c.c. of water, is well shaken and filtered. To the filtrate add 5 c.c. of concentrated sulphuric acid (sp. gr. 1.89) and a knife-pointful of manganese. The mixture is now distilled and the vapors conducted into a cylinder which contains either 5–10 c.c. of an alkaline solution of iodine (*i.e.*, equal parts of decinormal iodine solution and standard potassium-hydrate solution), or the same quantity of Nessler's reagent. If lactic acid is present, the aldehyde escapes with the vapors and gives rise to the formation of iodoform (turbidity and iodoform smell, Lieben's reaction), or (with Nessler's reagent) of the yellowish-red aldehyde of mercury as shown by the yellow color.

On the same principle, Boas also devised a quantitative method for determining the amount of lactic acid. This new test has certainly a scientific value, but thus far it has remained without practical importance. The procedure is quite complicated and hardly gives more accurate results than the usual test of Uffelmann described above.

4. Acidity.

The degree of acidity is examined by adding a drop of a one-per-cent. alcoholic solution of phenolphthalein to 10 c.c. of the filtrate and adding again as many cubic centimetres of a one-tenth normal sodium-hydrate solution until a slightly red color arises. The amount of cubic centimetres of the one-tenth sodium-hydrate solution required for that purpose is multiplied by ten and expressed with this figure—*i.e.*, the degree of acidity is expressed by the number of cubic centimetres of a one-tenth normal sodium-hydrate solution required to saturate or make slightly alkaline 100 c.c. of the filtrate. Thus if we find that 10 c.c. of the filtrate require 6 c.c. of the one-tenth normal sodium-hydrate solution in order to bring on the red color after the addition of phenolphthalein, we say the acidity is 60. The figure of acidity multiplied by 0.00365 gives the percentage amount of hydrochloric acid. If, for instance, the acidity is 60, then the percentage of hydrochloric acid will be $60 \times 0.00365 = 0.219$ per cent.

The different elements comprising the acidity, and their quantitative determination, we shall describe later on.

5. *Propeptone.*

The digestive action of the stomach results in the formation of propeptones and peptones from the albuminates. The best test for the presence of propeptone is the addition of an equal part of a saturated solution of sodium chloride to a small quantity of the filtrate. Propeptone then, if present, is precipitated, and the solution becomes the more turbid the greater the quantity of propeptone. In case no precipitate is formed, add a drop or two of acetic acid, then the solution will turn turbid in case propeptone is present. If heated the solution clears up again, and when allowed to cool the propeptone precipitates anew, and the solution again turns turbid.

6. *Peptone.*

A few cubic centimetres of the filtrate (best after having precipitated the propeptone and filtered) are made strongly alkaline by the addition of some sodium-hydrate solution and a few drops of a weak (one-per-cent) sulphate-of-copper solution added. The presence of peptone gives rise to a purplish or violet-red color (biuret reaction).

7. *Pepsin.*

A thin disc (1 cm. in diameter and about 1 mm. thick) of the white of a hard-boiled egg is put into a test tube containing 5 c.c. of the filtrate and kept at blood temperature. If hydrochloric acid is not present in the filtrate, it is necessary to add two drops of the dilute muriatic acid. The presence of pepsin effects a disintegration or a disappearance of the egg disc in two to six hours.

8. Rennet Ferment.

Take about 5 c.c. of milk in a test tube and add three to four drops of the filtrate. Mix thoroughly and keep the tube in a glass of warm water. In about ten to fifteen minutes the milk becomes curdled. In case coagulation does not occur in an hour or two, then no rennet ferment is present, although rennet zymogen may exist. To test for the latter, it is necessary to add to the same specimen of milk a few drops of a one-per-cent chloride-of-calcium solution, and again allow it to stand a few minutes. If the milk remains uncurdled even then, there was no rennet zymogen present, otherwise the coagulation would have taken place.

9–12. The Products of Starch Digestion.

The starchy derivatives resulting from the action of the ptyalin-digestion begun in the mouth and continued in the stomach, consist of erythrodextrin, achroödextrin, and maltose. A few drops of Lugol's solution (iod. 0.1, potass. iod. 0.2, aq. dest. 200.0) are added to a small quantity of the filtrate. The presence of (9) dextrin turns the fluid blue; (10) erythrodextrin gives rise to a red color. The (11) achroödextrin discolors the yellowish tint of the Lugol solution, while (12) maltose does not change the color of the solution. For maltose or sugar, we can besides make use of Trommer's test.

In the healthy condition, the results of the analysis of the stomach contents one to one and a half hours after the test breakfast are as follows: acid reaction; free hydrochloric acid present; lactic acid not present; total acidity varying from 40–60 (=0.015–0.21 per cent hydrochloric acid); propeptone present in small amount; peptone in larger proportions; pepsin and rennet present; sugar present; achroödextrin present; erythrodextrin present in small amounts or absent; dextrin absent. From these normal standards we find many deviations in the sick, and we shall have to investigate later on the chemical processes in the stomach in all disturbances of this organ.

Although the above tests will suffice for the great majority of cases, we find it necessary to give a few additional methods which are not complicated and which will serve to determine several factors in the gastric analysis more minutely. The acidity of the gastric contents is as a rule due to acid salts, acid compounds of albumin, and free acids (hydrochloric and lactic, and sometimes various organic acids). It is sometimes of importance to ascertain the presence, respectively the quantity, of each of these factors separately.

Volatile Acids.

The presence of fatty or volatile acids is recognized by boiling a few cubic centimetres of the filtrate in a test tube. A strip of wet, blue litmus paper is held over the vapors escaping at the top of the test tube. Their presence will turn blue litmus paper red. The quantity of these fatty acids can be ascertained by boiling 10 c.c. of the filtrate for about half an hour, adding to the residue sufficient distilled water until the quantity amounts again to 10 c.c., and now determining the degree of acidity in this liquid by phenolphthalein and sodium hydrate. This figure subtracted from the figure of the total acidity of the filtrate will give the quantity of the fatty acids.

Acetic Acid.

Acetic acid if present in larger quantities can easily be detected by its characteristic smell; if present in smaller quantities it may be detected by neutralizing the watery residue of the ethereal extract with carbonate of soda, and then adding neutral chloride-of-iron solution, when a beautiful red color is developed.

Estimation of Lactic Acid.

The quantitative determination of lactic acid may be made in the following way: 10 c.c. of the filtrate are well shaken with a larger quantity of ether. The ether is then separated from the watery solution and the degree of acidity determined in this. By subtracting the figure thus obtained from the total acidity and multiplying by 0.09, we have the percentage of lactic acid. This method presupposes the absence of volatile acids; if they are present, they have to be first eliminated by boiling. The further steps in the process of determining the quantity of lactic acid will then be performed in the way described.

Estimation of Free Hydrochloric Acid.

This can be done by any one of the following methods:

1. *Mintz's*[1] *Method.*—To 10 c.c. of the filtrate decinormal sodium hydrate is added in such a quantity that a drop of the mixture no longer responds to Günzburg's phloroglucin-vanillin test. The amount of the decinormal soda solution used multiplied by ten gives the figure of the free hydrochloric acid. The percentage of free hydrochloric acid can be obtained from this figure in the same manner as above stated for the total acidity, by multiplying it by 0.00365.

2. *Method of Moerner*[2] *and Boas.*[3]—The degree of acidity of free hydrochloric acid is here determined either by Congo paper or by a one-per-cent solution of Congo red as an indicator which turns blue in the presence of the acid. The decinormal soda solution is then added until the blue color begins to turn red. Boas takes 5 c.c. of the filtrate and 5 c.c. of the watery Congo-red solution (one per cent). I myself add only one or two drops of the same solution to the filtrate. The estimation is done in the same way as before.

3. *Toepfer's*[4] *Method.*—Toepfer makes use of dimethylamido-azobenzol in a half-per-cent alcoholic solution for the recognition and the estimation of the amount of free hydrochloric acid. Hydrochloric acid even in small quantities gives a red color with this indicator. The decinormal solution of sodium hydrate is added until the red color disappears; a faint yellow color arises. This method has been thoroughly

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[1] S. Mintz: "Eine einfache Methode zur quantitativen Bestimmung der freien Salzsäure im Mageninhalt." Wiener klin. Wochenschr., 1889, No. 20.

[2] Moerner: Maly's Jahresbuch f. Thierchemie, vol. 19, p. 253.

[3] Boas: Centralbl. f. klin. Medicin, 1891, No. 2.

[4] G. Toepfer: Zeitschr. f. physiolog. Chemie, Bd. 19, Heft i., 1894.

studied in this country by J. Friedenwald[1] and highly recommended.

From my own experience I would recommend this method for the quantitative determination of free hydrochloric acid, when the presence of the latter has been first demonstrated by Günzburg's test; for lactic acid, if present in considerable quantity, may also give a positive reaction with Toepfer's solution.

In a paper on this subject[2] which I published very recently it can be easily seen that lactic acid, if alone present, responds to Toepfer's test even if it exists in a percentage above 0.1, and in gastric contents if present in a percentage of 0.2.

Estimation of Combined Hydrochloric Acid.

The *combined* hydrochloric acid may be determined according to Toepfer by titrating with alizarin until the appearance of a violet color, and deducting the found acidity from the total acidity with phenolphthalein as an indicator. Toepfer asserts that alizarin is sensitive for all the elements comprising the acidity except for the combined hydrochloric acid.

In case free hydrochloric acid is absent, and it should be important to ascertain whether combined hydrochloric acid is present, the following method suggested by Sjoequist[3] and modified by Ewald[4] may be applied: 10 c.c. of the filtrate are mixed with about one-half gram barium carbonate in a platinum capsule. The fluid is then evaporated to dryness and reduced to ashes. After cooling, the residue is dissolved in hot water and filtered. Several drops of a concentrated soda solution are now added to the filtrate. If the fluid remains clear, hydrochloric acid is totally absent. If a precipitate forms after the addition of the soda solution, then the amount of this precipitate will allow us to judge approximately of the quantity of combined hydrochloric acid.

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[1] J. Friedenwald: Medical Record, April 6th, 1895.

[2] Max Einhorn: "The Dimethylamido-azobenzol or Toepfer's Test for Free Hydrochloric Acid." New York Medical Journal, May 9th, 1896.

[3] Sjoequist: Zeitschr. f. physiolog. Chemie, 1887, vol. 13, Heft 1–2, p. 1.

[4] C. A. Ewald: "Diseases of the Stomach," p. 39.

Estimation of Acid Salts.

Leo's Method.—The presence as well as the quantity of acid salts is best determined by Leo's'[1] method. A few drops of the filtrate are put in a watch glass and a small amount of powdered, chemically pure calcium carbonate is added, stirred with a glass rod, and the reaction tested with blue litmus paper. If it turns red, then acid salts are present, for the calcium carbonate combines only with the free acids but not with the acid salts.

Leo's method for determining the quantity of free and combined acid is based on the principle that calcium carbonate neutralizes free and combined hydrochloric acid, but not the acid salts at ordinary temperatures. As the degree of acidity of acid phosphates is larger when calcium chloride is present, and inasmuch as this salt is always developed in small quantities after the addition of calcium carbonate, Leo determines the acidity before and after the addition of the latter, having added calcium chloride to both. One proceeds as follows:

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[1] Leo: "Eine neue Methode zur Säurebestimmung im Mageninhalt." Centralbl. f. die med. Wissenschaft, 1889, No. 26.

After the separation of all organic acids from the filtrate, 10 c.c. (first portion) are taken, and 5 c.c. of a concentrated calcium-chloride solution added and the degree of acidity is determined by phenolphthalein and a decinormal sodium-hydrate solution.

Fifteen cubic centimetres of the filtrate of the gastric contents (second portion) are again taken and mixed with powdered, chemically pure calcium carbonate and filtered. Of this filtrate 10 c.c. are taken and placed in a bottle provided with a rubber stopper in which are inserted two glass tubes, one short and the other reaching down nearly to the bottom of the bottle. To the upper end of this long glass tube is attached a piece of rubber tubing terminating in a bulb, by means of which air can be introduced into the bottle. After the air has been blown in for some time, in order to drive out the carbonic acid that has formed, the acidity of the solution is determined with phenolphthalein and decinormal sodium-hydrate solution. By subtracting the figure of acidity obtained from the second portion from that obtained from the first, we have the amount of acidity corresponding to the free and combined hydrochloric acid.

If no organic acids have been present in the filtrate, the last-obtained figure, subtracted from the total acidity, will give the quantity of acid salts.

Other More Complicated Methods for the Determination of the Quantity of Hydrochloric Acid.

Method of Hehner and Seemann.[1]—10 c.c. of the filtrate are neutralized with a decinormal standard solution of sodium hydrate, evaporated to dryness over the water bath, and calcined over the flame. The residue consists of neutral salts + carbonate of sodium. The latter is determined in the following manner: The residue is washed with hot water and filtered as long as the filtrate gives an alkaline reaction. This filtrate is then titrated with a decinormal standard solution of sulphuric acid, until a slightly acid reaction arises. The amount of the decinormal standard sulphuric-acid solution used corresponds to the amount of inorganic acid. The difference between this figure and the figure of the total acidity expresses the amount of free and combined hydrochloric acid.

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[1] Seemann: Zeitschr. f. klin. Medicin, vol. v., p. 272.

Method of Hayem and Winter.[1]—The principle of this method consists in the determination, first, of the total amount of chlorides; second, of the fixed chlorides (chloride salts); and third, of the amount of chlorides combined with acids. Proceed as follows: In each of three porcelain dishes (*a*, *b*, *c*) place 5 c.c. of the filtrate. To dish *a* an excess of carbonate of sodium is added. All the three dishes are then evaporated to complete dryness over a water bath. A solution of carbonate of soda is now added in excess to dish *b* and the contents are again evaporated to dryness. All the three dishes are then calcined over a Bunsen burner, but the heating should not be carried too far, and the calcination should be arrested when there are no more points of ignition. To dishes *a* and *b* a slight excess of pure nitric acid is added and then some distilled water. After boiling the contents of these two dishes (*a* and *b*), they are thrown on a filter. Dish *c* is treated with boiled water alone and then also filtered. The amount of chlorides contained in the three different filtrates is then determined by a decinormal standard solution of nitrate of silver in the presence of yellow chromate of potassium as indicator. Dish a shows the total amount of the chlorides ($T =$ chlore total), $b =$ combined + fixed chlorine, and $c = F =$ chlore fixe; $b - c$ corresponds to the amount of combined hydrochloric acid $= C =$ chlore combiné; $a - b$ corresponds to the amount of free hydrochloric acid $= H =$ free hydrochloric acid. The total acidity is determined by titration with a decinormal sodium-hydrate solution and phenolphthalein as mentioned above.

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[1] Hayem et Winter: "Du Chimisme Stomachal," Paris, 1891, p. 72.

Determination of the Hydrochloric Acid Deficit.

Honigmann and von Noorden[1] advised that the amount of combined hydrochloric acid in cases in which free acid is lacking be determined by the amount of decinormal standard hydrochloric-acid solution required, in order to give a positive reaction for free hydrochloric acid, or they really determined the deficit of hydrochloric acid which exists in the filtrate, in order to combine with all the proteids. The more of the decinormal hydrochloric-acid solution it is necessary to add in order to give a positive reaction for free acid, the less the amount of combined hydrochloric acid in the filtrate. I do not think that this procedure is very important, for the degree of acidity alone already gives us a sufficient clew as to this condition. Moreover, the amount of peptone and propeptone qualitatively found in the filtrate will also indicate the greater or smaller amount of combined hydrochloric acid. If there is no combined hydrochloric acid whatever, then there will be no biuret reaction present.

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[1] Honigmann und von Noorden: Zeitschrift f. klin. Medicin, Bd. xiii.

During the last six or seven years a host of methods have been described, serving the purpose of determining analytically either the free and the combined hydrochloric acids or the chlorides. We need only mention the methods of Sjoequist,[1] Martius and Luettke,[2] and the above-described procedures of Hehner-Seemann[3] and Hayem-Winter.[4] All of these are quite complicated and far from being exact. It has been found that the gastric contents include considerable quantities of ammonia (NH_3) in the form of ammonium chloride (NH_4Cl). All the methods mentioned are based on results obtained under the application of heat, notwithstanding the fact that the latter will lead to the evaporation of ammonia and the formation of free hydrochloric acid. The error which thus arises merely from this circumstance exceeds ten per cent (Rosenheim,[5] H. Strauss,[6] and others). But besides the errors of these analytical methods, it has been found by the most eminent authors that in reference to treatment and diagnosis we do not derive from these tests any more data than from the simple method of titration and determination of free hydrochloric acid (Honigmann,[1] Von Noorden,[2] H. Strauss, Rosenheim).

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[1] Sjoequist: *L. c.*

[2] Martius and Luettke: "Die Magensäure des Menschen," Stuttgart, 1892.

[3] Seemann: Zeitschr. f. klin. Medicin, vol. 5, p. 272.

[4] Hayem et Winter: "Du Chimisme Stomachal," Paris, 1891, p. 72.

[5] Th. Rosenheim: Centralbl. f. klin. Medicin, 1892, No. 39.

[6] H. Strauss: Berl. klin. Wochenschr., 1893, No. 17.

For this reason I did not think it necessary to give a detailed account of all analytical methods. For practical purposes the determination of the total acidity (A=aciditas), of free hydrochloric acid (L=acidum hydrochloricum liberum), and the qualitative test for lactic acid as above detailed will suffice. In some instances Leo's method may also be applied; in this way the quantity of combined hydrochloric acid (C=acidum hydrochloricum combinatum) and the quantity of acid salts may be ascertained.

Contra-Indications to the Use of the Stomach Tube.

The application of the tube is not advisable in cases of recent hemorrhages, no matter whether from the stomach or from the lungs, in all cases of fresh ulcers of the stomach, aortic aneurism, and in markedly cachectic and debilitated persons. In cases in which there is a mere suspicion of an ulcer, some authors employ the soft-rubber tube, while others are opposed to its application.

Other Methods of Testing the Gastric Secretion.

Notwithstanding the great importance of the results derived from chemical analysis of the stomach contents obtained by means of the soft-rubber tube, this comparatively new method has not as yet been generally adopted by the medical profession, for the reason that the examination by means of the tube is often unpleasant and repugnant to the patient. Moreover, some patients absolutely refuse to undergo this method of examination. To obviate these difficulties several other methods have been devised:

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[1] Honigmann: Berl. klin. Wochenschr., 1893, Nos. 15 and 16.

[2] C. von Noorden: Berl. klin. Wochenschr., 1893, No. 18.

1. *Günzburg's*[1] *Method.*—Patient swallows 0.2 gm. potassium iodide enclosed in a small rubber bag fastened with fibrin threads. After the disintegration of the fibrin by digestion, the rubber bag opens and the potassium iodide is now set free and ready for absorption. As soon as iodine is detected in the saliva, we are sure that the fibrin has been digested and from this Günzburg concluded the presence of hydrochloric acid. This method, though ingenious, is not adapted for practical purposes, for while, on the one hand, it necessitates examining the saliva for quite a period of time (one to two hours), on the other hand the appearance of iodine in the saliva does not conclusively prove that the fibrin has been digested *in the stomach*. The rubber bag may have escaped into the intestines, the fibrin may have been digested there, and the potassium iodide absorbed. Thus we cannot reach any decisive conclusion as to the condition of *gastric* secretion by this method. The same remarks apply to Sahli's method, which corresponds in most respects to the one just described.

2. *Spallanzani and Edinger's Sponge Method.*—Edinger[2] fastened a small sponge to a silk thread which he caused his patient to swallow. After several

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[1] Günzburg: Deutsche med. Wochenschr., 1889, No. 41.

[2] Edinger: "Zur Physiologie und Pathologie des Magens." Deutsch. Arch. f. klin. Medicin, vol. 28, 1881.

minutes he withdrew the sponge from the stomach, and examined the contents squeezed out for hydrochloric acid. This method, which had been practised before by Spallanzani, is deficient in the following particulars: 1. The sponge is partly squeezed out during its withdrawal through the narrow passages (cardia and introitus œsophagi), and thus much of the gastric contents obtained is lost. 2. It absorbs some of the secretions of the œsophagus and pharynx. Thus the few remaining drops of gastric contents in the sponge are impure (that is, mixed with other fluids) and sometimes are altered in their chemical state.

3. *Stomach Bucket* (*Einhorn*[1]).—The bucket consists of a small capsule-shaped vessel (1¾ cm. long, ¾ cm. wide) made of silver; on the top there is a large opening surmounted by an arch to which a silk thread is tied, and a knot made at a distance of sixteen inches from the attachment.

Method: In order to obtain a sample of the stomach contents, proceed as follows: The bucket is dipped into lukewarm water, filled and emptied. (This serves to make the inside of the vessel moist, so that it will more easily take up the contents of the stomach.) Then the patient is asked to open his mouth widely, and the bucket is placed on the root of the tongue (almost in the pharynx); the patient should now swallow once or twice.

The vessel after a short time (one to two minutes) enters the stomach. As soon as the knot of the thread is at the lips the bucket is in the stomach, for the distance from the teeth to the cardia is usually sixteen inches. The vessel is left there for about five minutes and then withdrawn. During the withdrawal of the apparatus a resistance is usually felt at the introitus œsophagi. To overcome this difficulty, when the apparatus is at that narrow point the patient should swallow.

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[1] Max Einhorn: "A New Method of Obtaining Small Quantities of Gastric Contents for Diagnostic Purposes." Medical Record, July, 1890.

By the act of swallowing the larynx is pushed forward and upward, and thus the passage is free and the bucket can be withdrawn easily. If the stomach is not empty, the bucket returns filled and the amount is sufficient for making various important tests. In people suffering from an abundant secretion of the mucous membranes the bucket might become filled with mucus before entering the stomach, and then in emptying the vessel one would find clear mucus instead of chyme. In such cases it is necessary to make the trial again and to cover the opening with a thin gelatinous capsule, which keeps away the mucus from

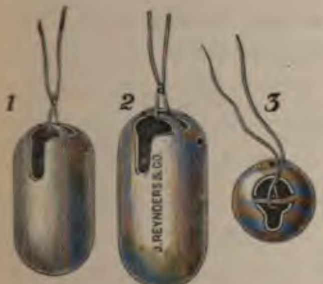

FIG. 13.—The Stomach Bucket (Einhorn). 1, Small size; 2, large size; 3, top view.

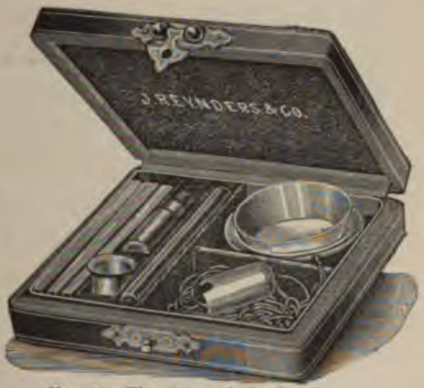
J.REYNDERS & CO.

FIG. 14.—The Stomach Bucket Set.

the vessel on its way to the stomach; there the capsule is dissolved and the stomach contents can now enter the apparatus. On its return from the stomach, the bucket being filled, the mucus cannot to any extent enter it. The best time for obtaining a sample of the stomach contents is one hour after Ewald's test breakfast.

This way of obtaining a small quantity of gastric contents for examination does not give any trouble, nor does it cause any exertion to the patient. Even in ulcer of the stomach there is no danger whatever from hemorrhage as a consequence of the examination. For this reason the method seems to be especially adapted to all cases where there is suspicion of an ulcer in the stomach, and where we desire to avoid the tube. It is also suitable for the general practitioner who does not intend to make an exact analysis of the gastric contents, but who desires to determine whether there exists free hydrochloric acid or not. The gastric contents withdrawn in the bucket are examined directly without being filtered, in the following way:

1. By means of blue litmus paper it can be determined whether the contents are acid; if so, the paper turns red.

2. With Congo paper whether there are free acids or only acid salts. The presence of free acids turns Congo paper blue, otherwise the Congo color is not changed.

3. If there are free acids it is necessary to find out whether there is hydrochloric acid present or not. For this purpose take one drop of the contents and one drop of Günzburg's solution and mix them thorough-

ly in a white porcelain dish. This dish is now heated over an alcohol lamp; when the fluid evaporates, a cherry-red color appears in the same spot whenever hydrochloric acid is present even in a very small amount.

4. The amount of hydrochloric acid, or the acidity, can be approximately determined by gradually diluting one drop of the contents with water until the above-mentioned Günzburg's reaction for hydrochloric acid begins to disappear in the diluted fluid. Normally the stomach contents can be diluted from eight to ten times and yet will give the Günzburg reaction. In this way cases in which we are able to dilute only five times, or even less, must be considered as cases of subacidity (too small amount of acidity), and cases in which we are able to dilute more than twelve times as cases of hyperacidity or superacidity (too large amount of acidity). In cases in which no acidity whatever is found, we have to deal with anacidity.

5. Pepsin and rennet, the two ferments of the stomach, generally accompany each other, and we can deduce the presence of one from that of the other. We prove the presence of the ferments by making the following test for the rennet ferment: Two drops of the stomach contents are mixed with about 2 c.c. of milk and kept either in a warm place or in a glass with warm water. The presence of rennet curdles the milk in from ten to twenty minutes.

Dr. Dickinson,[1] of Erie, Pa., has made a comparative study of the results obtained after an examination by means of the tube and a minute analysis of the filtered gastric contents, and the result gained after examination with a stomach bucket and the coarse method of analysis just described. He examined thirteen persons by means of both methods, and found that the results harmonized pretty closely. The degree of acidity corresponded quite accurately to the figure obtained by dilution.

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[1] Dickinson: "A Comparative Study between the Results Obtained by Examination of the Stomach Contents by Means of a Stomach Tube and Einhorn's Stomach Bucket." Medical Record, September 15th, 1894.

The examination with the tube is as a rule preferable to that with the stomach bucket, as the quantity of gastric contents obtained with the former is certainly larger, and permits a more detailed examination. Wherever, however, the examination with the tube is either contraindicated, or where the patients refuse its introduction, the examination with the bucket will certainly be able to replace the tube and afford us more thorough information as to the secretory functions of the stomach.

Exact Determination of the Quantity of Chyme within the Stomach.

The quantity of chyme can, as a rule, be determined by having the patient empty the contents of his stomach through the tube by means of the expression method. The quantity can then be directly measured, and will give the exact figure of the gastric contents, provided we are positive that the stomach is now empty. This may be determined by blowing air through the same tube into the stomach; if no bubbling sound is heard, but merely the sound produced by the air on striking the gastric walls, the organ may be regarded as empty. Occasionally, however, it is quite difficult to withdraw the entire quantity of gastric contents (especially in cases of dilatation of the stomach with stenosis of the pylorus). In the latter instance, the quantity of the gastric contents can be ascertained by the procedure described by Mathieu and Rémond.[1] This is done in the following manner: Some time after a meal a small portion of the contents is obtained by the ordinary expression method. Then the tube, while still within the stomach, is attached to the funnel arrangement (ordinarily used for lavage) and a certain quantity of water (usually 200 c.c.) poured into the stomach. By moving the funnel up and down several times and by having the patient shake his abdomen thoroughly, a complete mixture of the ingested water with the contents is soon accomplished. Another portion of the mixed gastric contents is now obtained. By determining the degree of acidity in the first and second portions separately, the amount of the original quantity within the stomach can be easily found, according to the following calculation: If *b* represents the undiluted portion withdrawn, *a* the acidity of this liquid, *á* the acidity of the diluted portion, *q* the quantity of water introduced into the stomach,—the amount of acid being the same in the diluted liquid as in the original undiluted gastric contents,—the following equation is obtained:

$$a\,x = \acute{a}\,q + \acute{a}\,x$$

which is equivalent to

$$x = \frac{\acute{a}\,q}{a - \acute{a}}$$

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[1] Mathieu et Rémond : Soc. de biolog., 8 Nov., 1890

The quantity of liquid originally contained in the stomach is then represented by the formula:

$$y = b + \frac{\acute{a}\,q}{a - \acute{a}}$$

or the quantity of contents originally in the stomach is equal to the number of cubic centimetres of water poured in within the stomach, multiplied by the degree of acidity of the second portion, divided by the figure resulting by deducting the degree of acidity of the second portion from the first, plus the portion previously withdrawn.

Abnormal Constituents of the Gastric Contents.

The gastric contents are sometimes mixed with some abnormal products, which may be of importance with regard to diagnosis. They may contain mucus, bile and intestinal juice, blood, and pus.

Mucus, if present in considerable quantity, is easily recognized. It usually occupies the upper part of the fluid, presents a more watery color, and can be partly lifted from the surface by means of a glass rod on account of its adhesive quality. If it is present only in small quantities, its existence in the gastric filtrate is best revealed by adding a few drops of dilute acetic acid, which then forms a characteristic precipitate, settling on the bottom of the vessel.

Bile and Intestinal Juice.—Small quantities of bile and intestinal juice in the stomach are often met with, even normally in examination of the patient in the fasting condition. The tube probably produces a slight regurgitation of the duodenal contents into the stomach. The frequent occurrence of considerable quantities of bile and intestinal juice within the stomach is always due to some abnormal condition, either to a relaxation of the pylorus or to a stenosis of the duodenum, situated below the mouth of the bile duct. The presence of bile is easily noticed, either by its golden-yellow color or (if mixed with gastric juice) by its more greenish aspect. Whenever there is doubt as to the presence of bile, the usual test which serves for its detection in the urine may be applied.

The presence of intestinal juice is recognized by its characteristic ferments, amylopsin, steapsin, trypsin.

1. The filtrate is mixed with one-per-cent solution of carbonate of sodium until it has a decidedly alkaline reaction. A flake of fibrin is then added to the filtrate, which is kept in a warm place for quite a while. The fibrin will then dissolve by the action of the trypsin.

2. Starch will be changed into maltose by the action of the amylopsin.

3. To a small portion of milk add a drop of blue litmus tincture and a few cubic centimetres of the neutralized filtrate and keep at blood temperature. The presence of steapsin very soon changes the blue color, and the milk becomes slightly reddish (caused by the decomposition of the fat into the fatty acids through the steapsin).

Blood.—Blood, if present in considerable quantities in the gastric contents, is very easily recognized. Fresh blood can hardly be mistaken for anything else, if present even in small quantities. The gastric contents mixed with blood present either a reddish or (if the blood is not fresh) a slightly brownish or coffee-ground color. Occasionally, if the blood is present in large quantities, the contents may appear black. The detection of blood in gastric contents which do not present the appearances just mentioned must be made in the following manner:

1. A drop of the contents may be examined under the microscope for the presence of red blood corpuscles.

2. *By the Spectroscope.* If the presence of fresh blood is suspected the filtrate of the gastric contents may be directly examined with the spectroscope. Blood, if present, will show the two lines of the oxyhæmoglobin. If the blood is not fresh, or if the gastric contents include a considerable quantity of free hydrochloric acid, then, according to Weber[1] and Boas,[2] the ordinary examination with the spectroscope would not show the presence of blood, as the hæmatin is not soluble in the filtrate. H. Weber therefore suggested the following procedure:

3. To the gastric filtrate add a few cubic centimetres of concentrated acetic acid, and shake thoroughly with sulphuric ether. The latter presents a Tokay-wine color if hæmoglobin or hæmatin is present.

4. *Heller's Blood Test.* A small quantity of the gastric filtrate in a test tube is mixed with the same quantity of normal urine, and sodium-hydrate solution is added until a decided alkaline reaction is obtained. The tube is now heated over the spirit lamp until it begins to boil. The appearance of a flaky dark-red

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[1] H. Weber: Berliner klin. Wochenschr., 1893, No. 19.

[2] J. Boas: "Diagnostik und Therapie der Magenkrankheiten," Theil 1, 3te Auflage, p. 206.

sediment proves blood (the reaction consists in the formation of hæmatin and its combination with the precipitated phosphates).

5. *Schönbein-Almén's Blood Test.* An emulsion of equal parts of freshly prepared guaiac tincture and ozonized oil of turpentine (*i.e.*, old oil of turpentine that has been exposed to the air) is poured into a test tube over the gastric filtrate: a white ring forms at the point where both mixtures meet, which ring assumes a Prussian blue color if hæmoglobin is present. Instead of ozonized oil of turpentine the following solution, which was proposed by Hühnerfeld, may be used:

℞ Acid. acetic. glacial.,	2
Aq. dest.,	1
Terebinthin. et spirit. vin. rectif.,	āā 100

6. *Teichmann's Hæmin Test.* A small quantity of the gastric contents is evaporated in a porcelain dish over a spirit lamp. A small part of the residue is placed on an object-glass and mixed with a quantity of pulverized common table salt. A drop of glacial acetic acid is poured over it, covered with a cover-glass, and slightly heated over a spirit lamp until small bubbles begin to rise. Another drop of acetic acid is now again added, and the specimen examined under the microscope. The presence of hæmin crystals (rhomboid shape and beautiful reddish color) proves blood.

7. *Korczynski and Jaworski's*[1] *Blood Test.* A small quantity of the filtered residue is placed in a small porcelain dish, a trace of chlorate of potassium

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[1] Korczynski und Jaworski: Deutsche med. Wochenschr., 1887, Nos. 47–49, p. 35.

and a drop of concentrated muriatic acid are added, and the mixture is slowly heated over a spirit lamp. After all the chlorine gas has escaped, one to two drops of a dilute solution of potassium ferrocyanide are added; a distinctly blue color (Berlin blue) arises if blood is present.

Pus.—Pus is very seldom found in the gastric contents and is recognized by its characteristic appearance under the microscope.

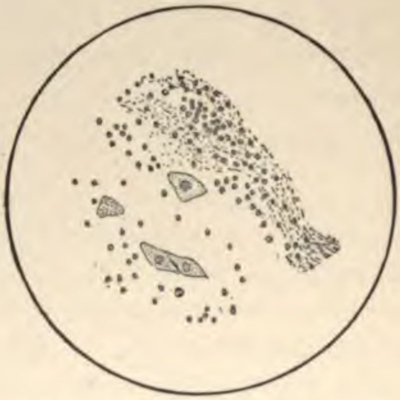

FIG. 15.—A Specimen of Mucus in the Gastric Juice obtained from a Patient in the Fasting Condition, showing mucous corpuscles, amorphous material, and few epithelial cells.

Microscopical Examination of the Gastric Contents.

(*a*) *Gastric Juice.* The microscopical examination of the gastric secretion found when fasting shows normally some epithelial cells, cell nuclei, mucous corpuscles, amorphous material, and some micro-organisms (see Fig. 15). The occurrence of snail-like cells in cases of hyperchlorhydria was first described by Jaworski,[1] who considered them a great rarity. Boas,[2] on the other hand, is of the opinion that they are of frequent occurrence. The latter writer considered them as substances which have developed from the mucus under the influence of the gastric juice. I concur with Boas in his statement that the snails are frequently found, and would like to add that they may also be found in patients not troubled with hyperchlorhydria. I found them once in a patient with normal secretion, and once in some fluid which had been obtained from the œsophagus of a patient troubled with cancer of the cardia. The snails may lie separately or in groups (see Fig. 16).

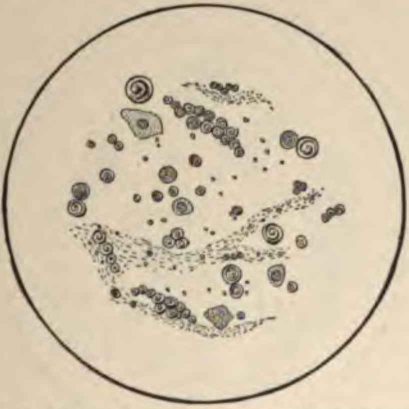

FIG. 16.—A Specimen of Mucus in the Gastric Juice obtained from a Patient in the Fasting Condition, showing single snail forms and some lying in groups; also amorphous material and few epithelial cells.

(*b*) *Gastric Contents.* The microscopical examination of the gastric contents at the height of digestion

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[1] **Jaworski**: Münchener med. Wochenschr., 1887, No. 32.

[2] J. Boas: "Diagnostik und Therap. der Magenkrankheiten," Theil i., 3te Auflage, p. 212.

(either one to one and a half hours after a test breakfast or three to four hours after a test dinner) will allow us to judge to a certain extent regarding the way the act of digestion has progressed. Normally only a few starchy granules are found, most of which have already lost their characteristic spiral configuration. The muscular fibres have likewise already undergone deep changes and do not show diagonal stripes. Plant cells, fat in fine globules, and different kinds of micro-organisms are found in small numbers. The presence of a large amount of unchanged starchy granules is most frequently found in cases of hyperchlorhydria, while unchanged muscle fibres, showing the diagonal stripes clearly, are found in cases with a diminished gastric secretion. The different varieties of micro-organisms found in the stomach have been thoroughly

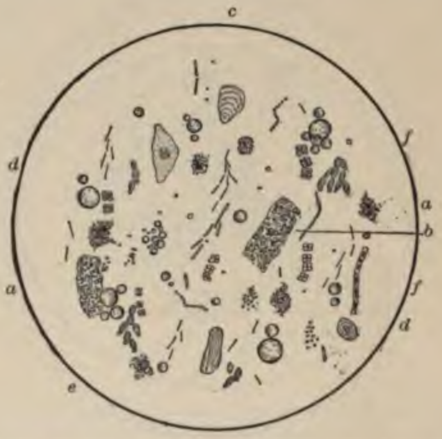

FIG. 17.—A Specimen of Gastric Contents in the Fasting Condition from Patient K., with Carcinoma Ventriculi. *a* and *b*, Partly digested muscle fibres; *c*, starch granules; *d*, fat globules; *e*, yeast cells; *f*, sarcinæ.

studied by De Bary,[1] Miller,[2] Macfadyen,[3] Nencki,[4] Abelous,[5] Boas,[6] and others. While a few years ago it was believed that no micro-organisms can develop in the stomach containing free hydrochloric acid in its juice, of late it has been proven by several authors that micro-organisms may thrive in the stomach even if it contains too large a quantity of hydrochloric acid—or, in other words, the hydrochloric acid (of the gastric juice) does not always exclude fermentative processes in the stomach. Thus Kaufmann,[7] of New York, has described a case in which a condition of hyperchlorhydria existed and in which the motor function of

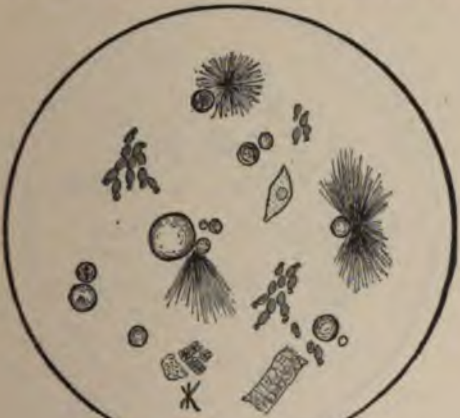

FIG. 18.—A Specimen of Gastric Contents from Patient with Ischochymia, showing sarcinæ, yeast cells, fat globules, and fat crystals.

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[1] De Bary: Arch. f. exper. Path. und Therap., Bd. 20, p. 243.

[2] Miller: "Die Mikro-organismen der Mundhöhle," Leipzig, 1892.

[3] Macfadyen: Journal of Anat. and Physiol., vol. 21, 1887.

[4] Macfadyen, Nencki, und Sieber: Arch. f. exper. Patholog., Bd. 28.

[5] Abelous: Thèse de Montpellier, 1888.

[6] Boas: Deutsche med. Wochenschr., 1892.

[7] J. Kaufmann: Berl. klin. Wochenschr., 1895, No. 6.

the stomach was not markedly disturbed, but which notwithstanding microscopically gave all symptoms of fermentative processes. The gastric contents always contained numerous living bacteria of various types. Dr. Kaufmann succeeded in separating the eight following micro-organisms from one specimen of the gastric contents by means of culture: (1) Yellow sarcinæ; (2) white yeast; (3) Micrococcus aurantiacus (Cohen); (4) Staphylococcus cereus albus (Passet); (5) Bacillus subtilis; (6) Bacillus ramosus; (7) a large, thick bacillus; (8) a short bacillus, resembling the Bacillus coli communis.

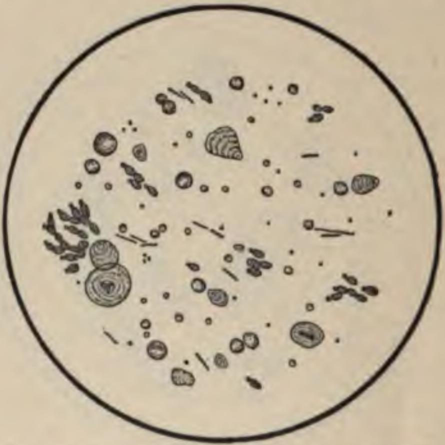

FIG. 19.—A Specimen of Gastric Contents One Hour after Test Breakfast (Patient with Hyperchlorhydria), showing many unchanged starch granules, yeast cells, and a great number of micro-organisms.

Boas has observed several cases in which, notwithstanding the presence of hyperchlorhydria, there was a decomposition of the albuminate of the food, resulting in the development of sulphuretted hydrogen. I have lately observed two cases of this nature myself.

In cases with abnormal fermentative processes within the stomach, the same kinds of micro-organisms are usually found as in the normal stomach, only in much larger number (Minkowski).[1] Yeast cells and sarcinæ occur in large numbers in cases with a distinct motor disturbance of the stomach (especially ischochymia). The sarcinæ ventriculi, which were first described by Goodsir[2] in 1842, occur in cubes or tetrahedrons (see Fig. 17 and 18), but they have only a pathognomonic significance if they appear in very large numbers.

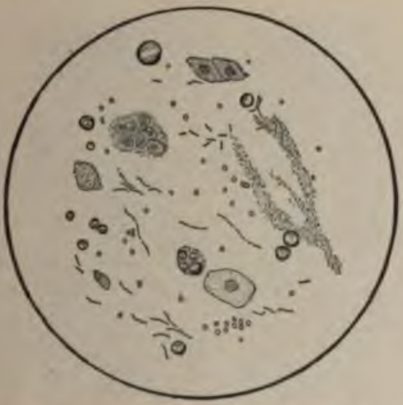

FIG. 20.—A Specimen of Mucus from the Œsophagus (from a Patient with Carcinoma Cardiæ, J. C. W.), showing mucus, bacteria, fat and epithelial cells, some of the latter grouped together.

(*c*) *Small pieces of gastric mucosa.* In washing out the stomach (especially in the fasting condition) occasionally a small piece of gastric mucosa may be found in the wash-water. Such a small piece of gastric mucosa may also be found occasionally in the gastric contents when examining the patient after a test breakfast or test dinner. Boas[1] was the first to make use of such specimens for microscopical examination. He was of the opinion that such an examination permits one to judge of the morbid anatomical condition of the given case. A short time afterward I observed that in some cases the occurrence of small pieces of gastric mucosa in the wash-water is a constant phenomenon.

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[1] Minkowski: "Mittheilungen aus der med. Klinik zu Königsberg," 1888.

[2] Goodsir, cited from Ewald: "Diseases of the Stomach," New York, 1892, p. 138.

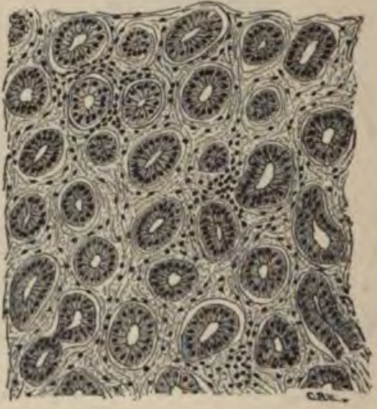

FIG. 21.—Group N (Normal). A small piece of gastric mucosa (patient Mrs. H.) presenting a cross-section of the glands in *normal* appearance. × 80.

The number of these pieces varies from one to four (see Erosions of the Stomach). During the last five years I had the opportunity to examine a great number of such small particles of gastric mucosa, a large part of which belonged to cases of erosions of the stomach, the remainder to many other affections. Such a piece of gastric mucosa looks quite red. The thickness may vary from ½ to 1 mm., while the size may vary from that of a large pin's head to that of a small bean. Sometimes they are found embedded in mucus. While the presence of glands in these small pieces may be found by examining them in the fresh condition under the microscope, a thorough examination can be made only after a sufficient preparation of these particles (hardening in alcohol, embedding in celloidin and staining with eosin, hæmatoxylin, picro-carmine, methylene blue, and thionin).

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[1] J. Boas: *L. c.*, p. 225.

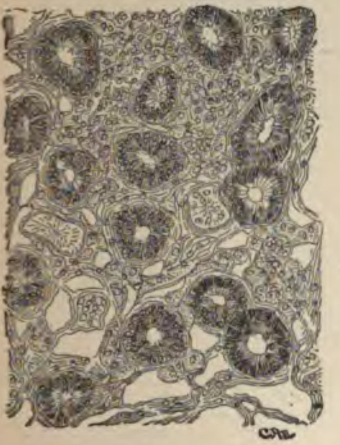

FIG. 22.—Group C (Connective-Tissue Formation). A piece of gastric mucosa (from patient Mrs. K. A.) showing beginning atrophy of glands (small pale areas within the glands) and *connective-tissue proliferation.* × 120.

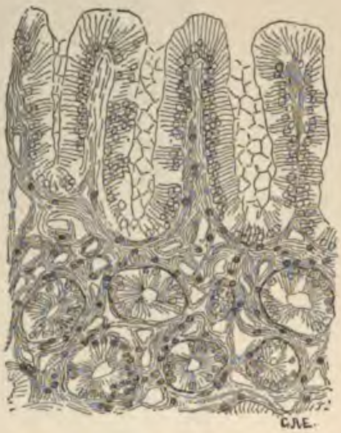

FIG. 23.—Group C (Connective-Tissue Formation). A piece of gastric mucosa (from H. R. D.) showing the mouths of glands; the pale spots show beginning atrophy of the glands; *connective-tissue proliferation* best shown in lower part of specimen. × 120.

In examining the microscopical picture of the different specimens the following groups can be easily distinguished:

1. N = Normal: glands and interglandular tissue exist in normal proportions.
2. C=Connective tissue: while there is a normal pro-

portion between glands and interglandular tissue, there is a marked proliferation of connective tissue around the glands.

3. P = Proliferation: there is a marked proliferation of glands; they are nearer each other and sometimes have an elongated and curved shape.
4. B = Beginning Atrophy: the glands exist in smaller numbers, and are sometimes also smaller in size; the interglandular spaces being quite large and filled partly with small-cell infiltration partly with connective-tissue formation.
5. A = Atrophy: complete atrophy; no glands visible only indications of their previous existence; round-cell infiltration.

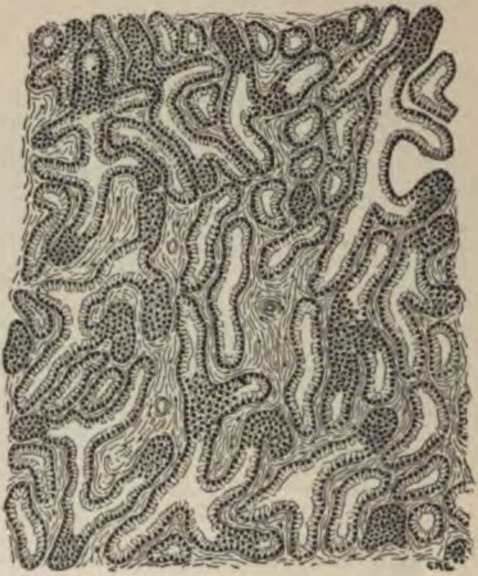

FIG. 24.—Group P (Proliferation of Glands). A piece of gastric mucosa (from patient C. C.), showing proliferation of glands. × 80.

6. V = Vacuolization: within the glands exist vacuoles of different shape, being the result of a mucoid degeneration of some glandular cells.

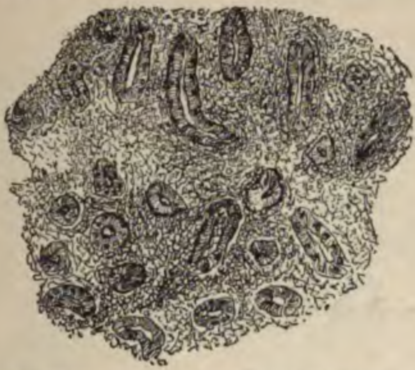

FIG. 25.—Group B (Beginning Atrophy). A piece of gastric mucosa (from patient B. E. with carcinoma cardiæ), showing destruction of glands by connective-tissue proliferation. × 60.

Sometimes one specimen shows characteristics belonging to two of the groups mentioned.

For the beautiful execution of the drawings I am indebted to Dr. C. A. Elsberg, who made them from my specimens (see Figs. 21 to 27). Although I think that the microscopical examination of these

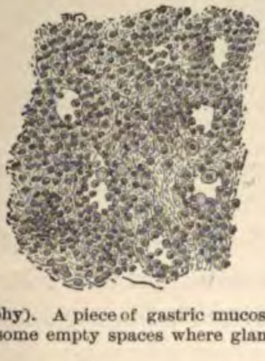

FIG. 26.—Group A (Atrophy). A piece of gastric mucosa (from patient R. H. D.). No glands visible, only some empty spaces where glands had previously existed × 80.

pieces of gastric mucosa is of great interest and may occasionally help to supplement the diagnosis, I do not believe that it permits us to judge positively about the original affection of the stomach, for in some cases I have noticed in the microscopical picture very few small glands, the whole field having the appearance of atrophy, and still the gastric secretion was perfectly normal. On the other hand, I[1] had a patient with distinct symptoms of chronic

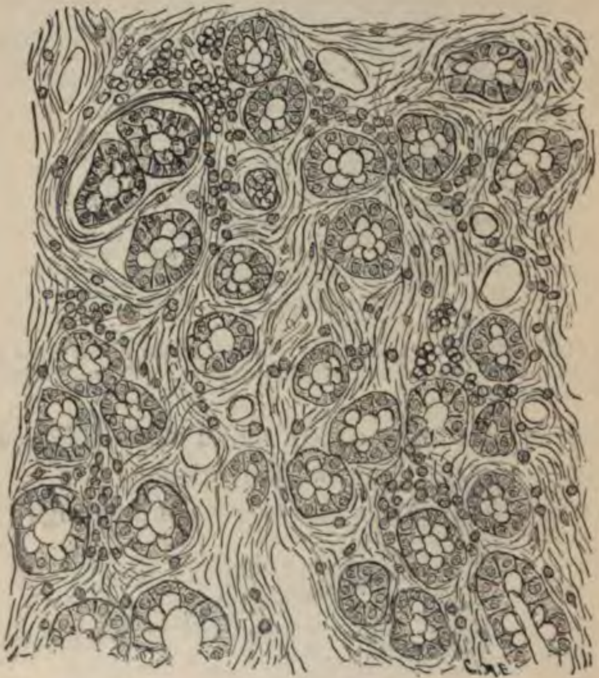

FIG. 27.—Group V (Vacuolization). A small piece of gastric mucosa (from patient J. with carcinoma pylori), showing mucoid degeneration of the glands with vacuolization; some connective-tissue proliferation. × 140.

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[1] For further details see Max Einhorn: "The State of the Gastric Mucosa in Secretory Disorders of the Stomach," Medical Record, June 27th, 1896.

gastric catarrh and diminished gastric secretion in which the pieces of gastric mucosa found in the wash-water presented a perfectly normal appearance (Fig. 21).

(*d*) *Particles of tumors.* In the gastric contents obtained after test meals, in the vomited matter, in the wash-water after lavage of the stomach, or within the tube after an exploratory examination, small particles of tissue may be found. These, if examined under the microscope, may occasionally reveal the nature of a tumor, whether cancerous or not. The examination is of importance if a characteristic picture of a malignant type is discovered. Most frequently such pieces may be obtained in cases of cancer of the cardia. I append a drawing obtained from a specimen of such a small piece of cancerous tissue from a patient with cancer of the cardia (Fig. 28).

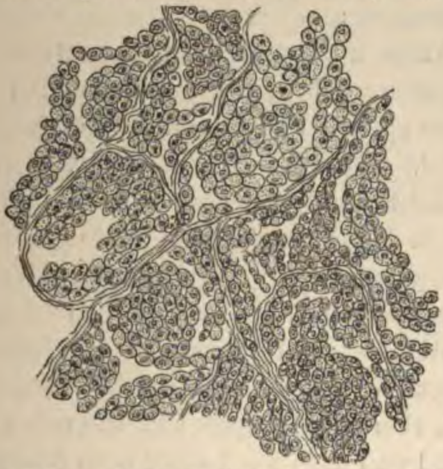

FIG. 28.—A Piece of Tumor (from B. E.) Obtained after Examination with Stomach Tube. In fresh condition it appeared white and was thicker and firmer than pieces of gastric mucosa. Cross-section presents all appearances of alveolar carcinoma. × 140.

OTHER FUNCTIONS OF THE STOMACH.

1. *The Absorptive Function of the Stomach.*

The absorptive function of the stomach is as a rule tested by Penzoldt and Faber's[1] method. One to two decigrams of potassium iodide are administered in a gelatin capsule and the saliva is examined every minute or two for the presence of iodine. This is done in the following manner:

Strips of starch paper (filter paper saturated with a starch solution and dried) are moistened with the saliva of the patient and then a drop of fuming nitric acid is added. The presence of iodine gives to the starch paper a slightly violet or blue color. Under normal conditions, it takes as a rule eight to fifteen minutes until the appearance of this reaction in the saliva.

Herschell[2] described another method of estimating the absorptive power by means of a capsule containing 2 decigm. of powdered rhubarb. If the stomach be normal, this should appear in the urine in fifteen minutes and will give a red color with liquor potassæ.

According to my experience, the absorptive faculty of the stomach should always be examined under similar conditions, as the results will differ materially whether the test is made in the fasting condition or when the stomach is full. It seems to me that in many instances several writers have not laid much stress upon this point, and in this way have come to wrong conclusions.

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[1] Penzoldt und Faber: "Ueber die Resorptionsfähigkeit der menschlichen Magenschleinhaut und ihre diagnostische Verwerthung." Berl. klin. Wochenschr., 1882.

[2] Herschell: "Indigestion," London, 1895, p. 115.

2. *Motor Function of the Stomach.*

Under motor function, as a rule, is understood the peristalsis of the stomach and the motion of the ingesta caused thereby within the organ, as well as the transportation of the food from the stomach into the intestines. I prefer, however, to distinguish that function which serves the purpose of expelling the gastric contents (prochoresis)[1] from the merely mechanical motions to which the ingesta are subjected within the organ (anakinesis).[2] This latter function we shall describe later on under the heading of mechanical function.

1. *Leube's Method.* The oldest method of ascertaining the condition of the motor function of the stomach is that first devised by Leube.[3] It consists in washing out the stomach six to seven hours after a large meal (dinner). Normally the stomach is found empty at that time—that is to say, all the food has already left the organ. Where large quantities of food are still found, it shows that the motor function is retarded. Washing out the stomach two to three hours after a smaller meal, like Ewald's test breakfast, may serve the same purpose, for normally the stomach is then found empty.

2. *Ewald and Sievers' Method.* Ewald and Sievers[4] have devised another, so to speak, clinical test, for the motor faculty of the stomach. The principle of the test consists in the property of salol, which is a

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[1] *ἡ προχώρησις*, the advancing.

[2] *ἡ ἀνακίνησις*, the shaking.

[3] Leube: "Krankheiten des Magens und Darms." Ziemssen's "Handbuch der spec. Path. und Therap.," Bd. 17, 2te Hälfte.

[4] Ewald und Sievers: "Zur Pathologie und Therapie der Magenectasien." Therap. Monatshefte, August, 1887.

compound of phenol and salicylic acid, of not being decomposed in acid solutions. In relatively feeble alkaline fluids salol is decomposed into salicylic acid and phenol and then absorbed. The gastric contents always being acid, the salol will not undergo any changes there. After leaving the stomach, however, and coming in contact with the intestinal juices which are alkaline, it is quickly split up into its two components. The salicylic acid is then absorbed by the blood and eliminated through the urine as salicyluric acid. The latter is easily recognized in the urine by the violet color produced on the addition of neutral ferric-chloride solution.

The salol test is made as follows: The patient takes 1 gm. salol in two gelatinous capsules half an hour after a slight meal. Before the ingestion of the capsules he empties his bladder, and then urinates every half-hour for about two hours. All the different specimens of urine are then examined with ferric chloride solution, and it must be ascertained in which specimen the violet color begins to appear. Normally it requires about an hour until the appearance of salicyluric acid in the urine; while in case of retarded motion of the stomach it takes two hours and even longer. In order to detect the earliest trace of salicyluric acid, Ewald first advised treating the urine with ether and then making the test in the ethereal residue. Afterward Ewald and I[1] suggested a simpler method which permitted us to dispense with the ether. This consists in moistening a piece of filter paper with the urine, and then placing a drop of ferric chloride solution by means of a glass rod upon the middle of the moistened paper. The edges of the drop will assume a violet color in the presence of even the smallest trace of salicyluric acid. These papers may be dried and preserved and in this way one can easily compare the reactions of the urine in the same patient at various times.

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[1] Ewald und Einhorn: "Verhandlung. des Vereins f. innere Medicin," 1888, p. 58. Max Einhorn: "Die neueren Methoden der Magenuntersuchung." New Yorker mediz. Monatschr., März, 1889.

Huber's Modification. Although normally, as a rule, the salicyluric acid appears in the urine about one hour after the ingestion of the salol, there are exceptions in which even in healthy people the reaction is greatly retarded. For this reason Huber[1] suggested to determine the length of time required for the complete disappearance of the reaction in the urine; for it is readily understood that the longer the time required for the salol to be absorbed and entirely eliminated through the urine the longer it has remained within the stomach. When the urine gives no reaction whatever, it shows that the whole amount of salol has long since left the stomach, and has been eliminated from the organism. In case of retarded motion of the stomach, parts of the salol remain and leave this organ only after a very long time. In this way the reaction of the salicyluric acid will extend over a prolonged period. Huber found that normally the excretion of the salicyluric acid after 1 gm. of salol lasted twenty-four hours; in patients with enfeeblement of the motor function of the stomach it lasted forty-eight hours or even longer.

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[1] Huber: "Die Methoden zur Bestimmung der motorischen Thätigkeit des Magens." Correspondenzbl. f. Schweiz. Aerzte, 1890.

The salol test, as suggested by Ewald or as modified by Huber, certainly gives a clew as to the condition of the motor function of the organ and is clinically of value, although either of them is by no means absolutely reliable.

3. Klemperer's Oil Test. Oil is not absorbed by the stomach wall. If, therefore, a certain quantity of oil be ingested and the stomach emptied after a certain period, it will be possible to judge from the amount of oil withdrawn the state of the motor faculty; for the greater the quantity of oil recovered the less has left the organ. Klemperer[1] proceeds as follows: After washing out the stomach, he pours about 100 c.c. of pure olive oil into the empty organ. Two hours later the stomach is aspirated and whatever oil is left removed as thoroughly as possible. The difference between the original quantity of oil and that withdrawn indicates the state of the motor function of the stomach. According to Klemperer, normally at this time only 20 to 40 c.c. of the oil ought to be found. This method, however, is complicated and to some objectionable; and as the results obtained by it do not allow more conclusions than the method of Leube, it has not come into extensive practical use.

4. Examination of the Stomach in the Fasting Condition. The best and easiest way to test the motor function of the stomach is to examine this organ, by means of the tube and lavage, in the morning in the fasting condition after the ingestion of a substantial supper on the night previous. Normally the stomach is empty, and therefore when the organ is found to contain a quantity of food, this is the best sign of retarded motion. This method is practically used by most writers.

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[1] Klemperer: "Ueber die motorische Thätigkeit des menschlichen Magens." Deutsche med. Wochenschr., 1888, No. 47.

Mechanical Function.

Under the mechanical function of the stomach we understand those changes which arise in the physical condition of foods and are produced by motions of this organ. These motions are of two characters: (1) active (peristaltic) and (2) passive (transmitted, respiratory, and pulsatory). Both motions shake the contents of the stomach and cause all parts of the food to come into direct contact with the gastric mucosa.

The Gastrograph.—Until recently there was no way of ascertaining this mechanical function of the stomach in the living. All the experiments made with regard to this subject have been performed on laparotomized animals. These, however, scarcely permitted any conclusions as to the manner in which peristalsis of the stomach normally takes place; for animals prepared for such experiments (after being chloroformed or etherized) are certainly not normal.

As the mechanical action consists in the churning of the contents, and as by estimating the latter we may determine the first, I have constructed an apparatus which indicates every motion to which it may be subjected. The whole apparatus comprises: 1. The ball (being the principal part). 2. A few electric cells. 3. The ticker.

The ball (Fig. 29) consists of two hollow metallic hemispheres (*a*), which are screwed together; within it is lodged and attached to the upper hemisphere, but perfectly insulated from the same at the attachment, another ball provided with spikes (*b*) radiating in all directions, but not touching the inside walls of the hemispheres; another very small platinum ball (*c*) lies within the large ball and can freely move in all directions, knocking at the spikes (see Fig. 30). Two insulated wires—one connected with the hollow ball, the other with the spiked ball—are encased in a very fine, thin rubber tube, forming the cable, and separate at the end into two branches, which must be attached to an electric battery. As soon as the platinum ball touches one of the spikes an electric circuit is made; when, however, the platinum ball moves a little way and ceases to touch the spike the current is broken. At each motion of the ball apparatus a rolling of the little platinum ball takes place and the electric current is either closed or broken. When the apparatus is at rest there is no change in the current. On connecting the "ticker" with the battery and the ball, each motion of the latter will be recorded on the

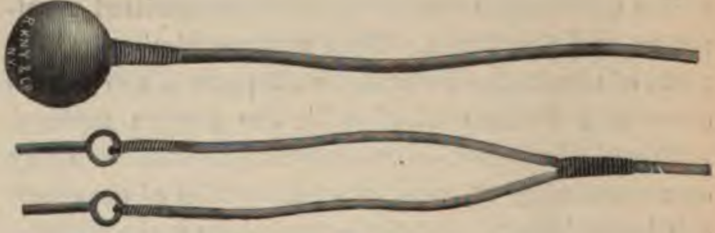

FIG. 29.—The Ball Apparatus of the Gastograph (Einhorn). Natural size.

paper in showing the "breaks" and "makes" of the current.

If the ball is swallowed and brought into the stomach, the motions of the former—which are caused by the active and passive motions of the stomach—can be recorded in the way described.

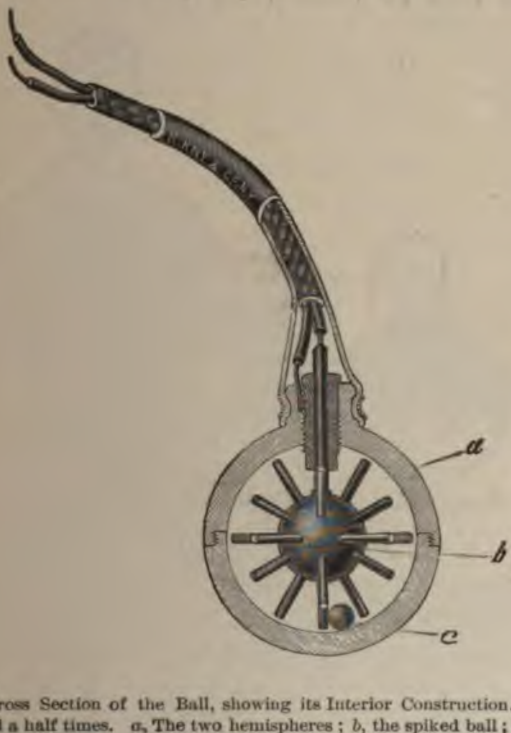

FIG. 30.—Cross Section of the Ball, showing its Interior Construction. Enlarged three and a half times. *a*, The two hemispheres ; *b*, the spiked ball ; *c*, the platinum ball.

I have called this apparatus "gastrokinesograph," or, shorter, "gastrograph."[1]

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[1] The gastrograph may be obtained of Richard Kny & Co., 17 Park Place, New York.

From numerous tests which I have made, it appears with certainty that the gastrograph works in the desired manner—*i.e.*, it indicates the motions of the ball and can thus be utilized for the valuation of the motions of the stomach or the mechanical action of this organ.

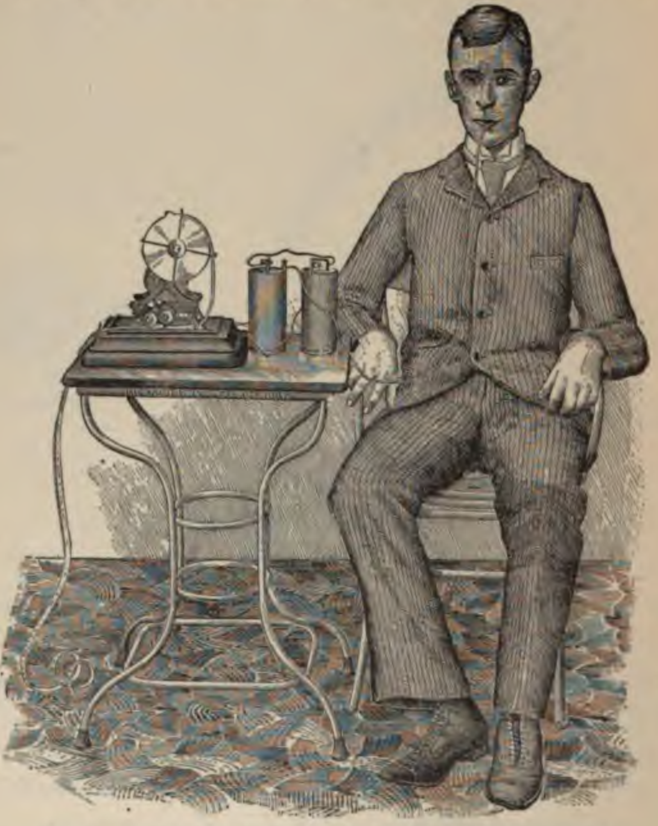

FIG. 31.—A Patient Undergoing Examination with the Gastrograph.

Method.—The ball is dipped in lukewarm water, introduced into the pharynx of the patient, and the latter told to swallow. The patient may drink some water. After a short while (from a minute to a minute and a half) the ball reaches the stomach. It is advisable to let the ball slip far down into the stomach, so that the distance from the mouth to the ball (length of cable) is about 50 cm. The cable is then connected with the battery and the indicator and the latter set agoing for three minutes (Fig. 31). The patient during this procedure sits quietly on a comfortable chair. At the end of three minutes the indicator is checked, the cable disconnected from the battery, and the ball withdrawn from the stomach. When at the introitus œsophagi, it is necessary, here in the same way as when using the bucket[1] or the deglutable electrode, to have the patient swallow, and to utilize the moment when the larynx goes upward and forward, to withdraw the ball without using any force whatever.

The strip of paper which has rolled off from the reel is cut off and the marks are then perused. The black line shows when the current was closed, the empty places when there was no current. As an instance I give a few gastrograms (reduced ten times) (Fig. 32). It is practical to enter the marks of the strips into a copy-book. This is done in the following way: Each line is divided into three equal spaces—each space corresponding to one minute—each space (or minute) into ten divisions, and the "breaks" and "makes" of the current marked with dots at the corresponding place. In this way the number of current changes can very easily be looked over and comparisons made.

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[1] Max Einhorn, Medical Record, July 19th, 1890.

(*a*) *Physiological.*—I have made several tests with the gastrograph on healthy people.

The experiments show that the stomach is not so inactive mechanically as several authors believed, and that it churns the contents almost continously with slight periodical interruptions.

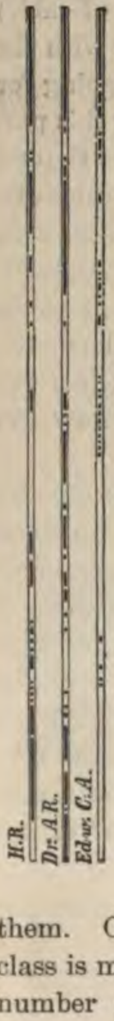

Fig. 32.—Three Gastograms Obtained from Patients H. R, Dr. A. R., and Edw. C. A.

The number of motions for three minutes averaged from four to forty-one.

When fasting, the mechanical action of the stomach seems to be much less than after meals.

(*b*) *Pathological.*—Most patients have been examined with the gastrograph either when fasting or from an hour to an hour and a half after the test breakfast, taking about half a glassful of water when swallowing the ball; many of the patients have been examined under both conditions on different days. Some of them have been subjected to a very great number of tests, in order to ascertain whether there is a certain constancy in the results. The whole number of patients examined was twenty-seven, the number of tests sixty-four.

In perusing the gastrograms obtained from my patients and comparing them with those obtained from healthy people, there are three different classes among them. One corresponds to the normal ; the second class is marked with too much mechanical action, the number of dots being greatly increased ; the third class shows a remarkable slowness and sluggishness of the mechanical function, the number of dots being reduced to 4, 3, or 0.

Hemmeter-Moritz's Method.—As the gastrograph does not permit of a distinction between the active and passive motions of the stomach, Dr. J. C. Hemmeter,[1] of Baltimore, has recently devised another method for testing the gastric peristalsis. The essential part of the apparatus is a deglutible elastic stomach-shaped bag of very thin rubber and attached to an œsophageal tube. The stomach-shaped pouch has the shape of the stomach only when it is blown up. It does not occupy much space when it is collapsed and can be introduced without difficulty into the stomach of patients. The œsophageal tube may be very small, not quite half the size of the ordinary tube used in lavage. When the bag has reached the stomach, which can be determined by a mark previously made on the tube, it is filled with air and connected either with a water manometer or tambour on the Ludwig kymograph. The slightest contraction of the involuntary fibres of the gastric muscle layer will compress the very elastic intragastric bag and distend the tambour, to which a glass bulb ink pen is attached, recording the gastric peristalsis as the clockwork moves the paper along. On the upper margin of the kymographion paper a record pen connected with a chronometer indicates seconds on the record by small dots, so that it is possible to determine the time of occurrence and duration of the gastric peristalsis. As the stomach perceptibly moves with every inspira- ıd expiration, a pneumograph is tied around the

Hemmeter: New York Medical Journal, June 22d, 1895.

patient's waist recording every respiratory movement on the kymograph. It will be seen on the tracing that many movements of the pen connected with the intragastric bag are passive and caused by the act of respiration, but there are other very high and long excursions of the gastric pen which are independent of the movement of the pneumographic pen, or occur when respiration is suspended for a short while. These are the muscular contractions proper of the stomach. The same method has been independently used and described by Moritz, of Munich.

In his paper Hemmeter says: "In making studies on the kymograph on the gastric motility, only such patients are taken as have become accustomed to the stomach tube, as the nausea and vomiting first attending the initial introduction of the tube make an exact record impossible."

This sentence shows that this apparatus cannot be applied without difficulty and for this reason appears unsuitable for practical purposes. Although the gastrograph does not permit a distinction between the active and passive movements, it affords, nevertheless, an accurate idea as to the mechanical action as such, for the passive movements certainly also participate in this function of the stomach and should not be ignored. In this way I think that the gastrograph method, not being so complicated and being easily performed, presents many advantages over Hemmeter's apparatus.

CHAPTER III.

DIET.

DIETETICS comprise the study of nutrition in health and disease and of the substances serving for this purpose (the diet). All living organisms derive their nourishment from the vegetable kingdom, either directly, or indirectly by living upon animals which in turn live upon a vegetable diet. Foods are substances which are required for the nutrition and maintenance of the body; they replace its wastes and losses.

In studying the normal nutrition of man we perceive quickly that there is a great variety in the food of healthy persons with regard to the quantity as well as to the different food substances. Nevertheless, they all contain the three groups of food-stuffs: Albumin, carbohydrates, and fats. Thus, for instance, vegetarians live and thrive principally on vegetables; the Esquimaux, on the other hand, almost exclusively on animal diet. The golden path, however, lies intermediate, and all authors (Voit, Pettenkofer, Hoffmann, Forster, and Gruber) recommend a combination of animal and vegetable food. R. Virchow likewise is of the same opinion, and expresses himself regarding this question as follows: "Although the Kirghez and the Esquimaux show us that health and life can exist through many generations on an exclusively nitrogenous diet—other tribes (Hindoos) live principally on non-nitrogenous food—still history shows us that the highest attainments of the human race have emanated from nations who have lived and live on mixed diet." A mixed diet, taken partly from the vegetable and partly from the animal kingdom, is the most suitable form of nourishment. We obtain the greatest amount of carbohydrates from the vegetable kingdom, while a great deal of the albumin is derived from animal food. The relation between animal and plant albumin, according to Munk and Uffelmann,[1] should not be less than three to seven. As regards the quantity of food, according to the same authors, an adult doing a medium amount of work requires daily 118 gm. albumin, 56 gm. fat, and 500 gm. carbohydrates.

Food only in small portions serves the purpose of reconstructing tissue waste; in its largest part, however, it is used for generating the heat requisite for the maintenance of life. For that reason it is customary to speak of the necessary amount of heat units during twenty-four hours instead of the quantity of food. By "heat unit" is meant, as is well known, that quantity of heat which is required to raise the temperature of 1 gm. of water 1° C. "Great heat unit" means the amount of heat required for warming 1,000 gm. of water 1° C. Each kind of food is ultimately oxidized in the body to its end products, and is in greatest part exhaled in the form of carbonic acid; the more carbon atoms a food-stuff contains the more heat units it will generate. In speaking of the heat value of food, the great heat units are used, the term "great," however, being omitted. Thus 1 gm. of albumin generates 4.1,

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[1] Munk und Uffelmann: "Die Ernährung des gesunden und kranken Menschen," Wien, 1887.

1 gm. of fat 9.3, and 1 gm. of carbohydrate 4.1 heat units. If we know the quantity of nourishment taken, the amount of the introduced heat units is easily determined by multiplying the different food-stuffs by the above-given figures. The daily amount of heat generated by the body, or necessary for the maintenance of the same, has been approximately estimated at twenty-five hundred heat units.[1] The heat value of the food taken by an average working person amounts, according to von Noorden,[2] to about forty heat units when working, and when resting to about thirty-four heat units per kilogram a day.

The following table of the composition of the different foods and the amount of heat units they produce will make it easy to figure out whether a certain known quantity of taken nourishment is sufficient to maintain the body in balance or not.

COMPOSITION OF THE MOST COMMON FOOD SUBSTANCES.

I. Dairy Products.

	Albumin, per cent.	Fat, per cent.	Carbohydrate, per cent.	Calories, per 100.
Cow's milk	4.0 to 4.3	3.0 to 3.8	3.7	64
Cream	3.61	26.75	3.52	276.01
Butter	0.5	90.0	0.5	837
Whey	0.5	0.3	3.6	
Buttermilk	3.0	1.3	3.0	3.67
Kumyss (of cow's milk)	3.35	2.07	0.7 lactic acid 1.9 alcohol 0.8 carbonic acid	32.99
Cheese (cream)	25.0	30.0	3.0	394
Cheese	33.0	9.0	5.0	240
Egg	12.5	12.0	0.5	165

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[1] Koenig: "Die menschlichen Nahrungs- und Genussmittel," Berlin, 1883, p. 53.

[2] Von Noorden: Berliner Klinik, Heft 55.

II. Meats and Game.

	Albumin, per cent.	Fat, per cent.	Carbohydrate, per cent.	Calories, per 100.
Beef (fat)	17.19	26.38	....	315.81
Beef (lean)	20.78	1.50	....	99.15
Veal (fat)	18.88	7.41	0.07	146.61
Veal (lean)	19.84	0.82	....	86.97
Mutton (very fat)	14.80	36.39	0.05	399.31
Mutton (leaner)	17.11	5.77	....	123.81
Pork (fat)	14.54	37.34	....	406.88
Pork (lean)	20.25	6.81	....	146.36
Ham (Westphalian)	23.97	36.48	1.50	453.69
Sweetbread	22.0	0.4	....	93.92
Pulverized meat	64.5	5.24	2.28	322.53
Poultry	22.0	1.0	....	100
Spring chicken	18.49	9.34	1.20	167.59
Duck (wild)	22.65	3.11	2.33	131.36
Squab	22.14	1.00	0.76	100.07
Game	23.0	1.0	....	103.60
Hare	23.34	1.13	0.19	107.08
Venison	19.77	1.92	1.42	105.44

III. Fish.

	Albumin, per cent.	Fat, per cent.	Carbohydrate, per cent.	Calories, per 100.
Pike	18.5	0.5	0.75	83.57
Carp	20.61	1.09	....	94.64
Shellfish	17.09	9.34	....	156.93
Salmon	15.01	6.42	2.85	132.93
Sardellen	22.30	2.21	0.45	113.83
Oysters	4.95	0.37	....	24
Salt herring	19.5	17.0	0.5	
Caviar	28.04	16.26	7.82	

IV. Cereals and Vegetables.

	Albumin, per cent.	Fat, per cent.	Carbohydrate, per cent.	Calories, per 100.
Sago	0.5	traces	86.5	356.70
Wheat flour	8.5	1.25	73.0	345.78
Rye flour	10.0	2.0	69.0	342.50
Wheaten bread	6.0	0.75	52.0	245
Rye bread	4.5	1.0	46.0	216
Roll	6.82	0.77	43.72	213.87
Zwieback	9.5	1.0	75.0	356
Cauliflower	2.0 to 5.0	0.4	4.0	35

IV. CEREALS AND VEGETABLES.—*Continued.*

	Albumin, per cent.	Fat, per cent.	Carbohydrate, per cent.	Calories, per 100.
Carrots	1.04	0.21	6.74	33.85
Asparagus	2.0	0.3	2.5	21
Rice	5.5	1.5	76.0	348.10
Beans	19.5	2.0	52.0	311.75
Peas	19.5	2.0	54.0	319.95
Potatoes	1.5	....	20.0	88
Oatmeal	12.5	5.26	66.77	338.80
Barley meal	8.31	0.81	75.19	323
Spinach	3.49	0.58	4.44	38
Pickles	1.02	0.09	0.95	

V. SOUPS AND BEVERAGES.

	Albumin, per cent.	Fat, per cent.	Carbohydrate, per cent.	Calories, per 100.
Milk soup with wheat flour	5.0	3.25	15.0	112
Meat broth (ordinary)	0.4	0.6		
Meat juice (pressed)	6.0 to 7.0	0.5		
Beef tea	0.5	0.5		
Leube's meat solution	9.0 to 11.0 albumin +1.79 to 6.5 peptone			
Malt extract	8.0 to 10.0	....	55.0	258.30
Barley soup	1.5	1.0	11.0	60.96
Rice pap with milk	8.8	3.5	28.6	182.61
Coffee	3.12	5.18		
Tea	12.38			
Beer	0.5	5.25	0.3	
Porter	0.7	6.0	0.3	60

VI. FRUITS.

	Free acid, per cent.	Albumin, per cent.	Fat, per cent.	Carbohydrate, per cent.
Apples	0.82	0.36	....	7.22
Pears	0.20	0.36	....	3.54
ums	1.50	0.40	....	4.68
hes	0.92	0.65	....	7.17
	0.79	0.59	....	1.96
ries	0.93	0.54	0.45	1.01
	....	5.48	1.37	38.34
	....	....	....	3.40
	....	1.20	....	5.28

According to K. Vierordt[1] an adult takes in form of food a daily average of 120 gm. albumin, 90 gm. fat, 330 gm. carbohydrate (the relation of the nitrogenous food-stuffs to the non-nitrogenous being 1 to 4), and 2,818 gm. of water. The above-mentioned figures differ from those given by F. Hirschfeld.[2] This author considers 80 gm. of albumin as the lowest amount contained in a sufficient diet. Some experiments which I[3] have made in order to determine the amount of nourishment taken by myself during the summer showed figures which resembled those of Hirschfeld. The quantity of albumin was 79.39, fat 54.3 and carbohydrate 263.9; the total of heat-units equalled 1,912.5. The amount of heat-units per kilogramme a day was 32.2. Victuals are composed mostly of all the three food groups (albumin, carbohydrate, fat) and water, and contain in minute amounts the inorganic salts found in the body.

We are accustomed to speak of easily digestible foods, and those difficult of digestion. The term of easily or less digestible cannot, however, be explained without some qualifications. Many writers judge the digestibility of foods by the length of time they require for their digestion in the stomach. Penzoldt[4] has lately made many investigations with regard to the sojourn of food in the stomach in health. He, however, lays stress on the distinction between gastric and intestinal digestibility, the former being recognized by the length of time the food remains in the stomach, the latter being measured by its more or less complete utilization or assimilation, that is, the amount of residue excreted with the fæces. In giving a list of the digestibility of different foods I follow Penzoldt's views.

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[1] K. Vierordt: "Grundriss der Physiologie des Menschen," 1887, 3 Auflage, pp. 288, 289.

[2] F. Hirschfeld: Berliner klin. Wochenschr., 1893, No. 14.

[3] Max Einhorn: "Dietetics in Diseases of the Stomach." Medical Record, June 24th, 1893.

[4] Penzoldt und Stinzing: "Handbuch der speciellen Therapie innerer Krankheiten," Jena, 1895.

A. Animal Foods.

These comprise besides the flesh (muscles) of the different mammals, birds, and fishes several other portions of their bodies, as, for instance, various glands, brain, lung, liver, etc. Oysters and lobsters also belong to this group. In most instances the digestibility of this group of foods corresponds to their richness in fat. The less fat they contain the more digestible they are. Thus we have the following list of animal foods classified according to their digestibility:

	Fat per cent.
Calf's sweetbread, veal, cod-fish, pike, oysters	0.4 to 1
Beef, hare, spring chicken, pigeon, partridge, carp	1 to 1½
Mutton, pork	5 to 7
Goose, caviar, herring, salmon, eel	over 8

The digestibility of food is greatly dependent on its quality and preparation. Young animals have soft and tender meat, whereas the flesh of old ones is tough. The different portions of the body vary also frequently in their digestibility. The time that has passed since the killing of the animal is also of importance. Fresh meat which is yet in its rigid state is tough and therefore very indigestible. In the preparation of the meat we must see that it is separated from all indigestible matter (fascia, tendons, cartilage). By pounding the meat the connective tissue surrounding the muscle fibre is torn. By chopping, scraping, or grinding the meat, its digestibility is increased. All other methods of preparing meat serve to improve its taste. For, according to Penzoldt, raw meat is more easily digested than that which has been boiled, broiled, or fried. The application of heat also diminishes the danger of infection, as many micro-organisms are destroyed by it.

Eggs are especially rich in albumin and fat. According to Penzoldt, soft-boiled eggs (three minutes in boiling water) are easiest to digest. Then come raw eggs and scrambled eggs, while hard-boiled eggs and omelet soufflé are difficult of digestion. (Soft-boiled eggs remain in the stomach one and three-quarter hours, hard-boiled, three hours).

Milk is intended as the sole food of young animals and as such contains all the elements of a typical diet: (1) Albuminous substances in the form of casein and serum albumin; (2) fats in cream; (3) carbohydrates in the form of lactose or milk sugar; (4) salts, chiefly calcium phosphate; and (5) water. Milk does not stay in the stomach much longer than plain water and must therefore be considered very digestible.

Several articles of food are obtained from milk:

(*a*) Cheese, which is the casein precipitated with more or less fat, according as the cheese is made of skimmed milk (skim cheese), or fresh milk with its cream (Cheddar and Cheshire), or of fresh milk plus cream (Stilton and Double Gloucester). The precipitated casein is allowed to ripen, by which process some of the albumin is split up with formation of fat.

(*b*) Cream consists of the fatty globules encased in casein and which, being of lowest specific gravity, rise to the surface.

(*c*) Butter or the fatty matter deprived of its casein envelope by the process of churning.

(*d*) Buttermilk is the fluid obtained from cream after butter has been formed. It is therefore very rich in nitrogen.

(*e*) Whey is the fluid which remains after the precipitation of casein. It contains sugar, salt, and a small quantity of albumin.

B. Vegetable Foods.

All of these contain more or less carbohydrates, and the principal amount of carbohydrates of our diet is obtained from them.

1. *Foods rich in proteids.* Leguminous foods (peas, beans, lentils, etc.) contain a nitrogenous substance called legumin, which is allied to albumin, in the proportion of twenty-five per cent. They form a chief source of the nitrogen of the food of vegetarians.

2. *Foods rich in carbohydrates :*

(*a*) Cereals. Bread made from the ground grain obtained from various so-called cereals, namely, wheat, rye, maize, barley, rice, oats, etc., is the direct form in which the carbohydrate is supplied in an ordinary diet. Besides starch it contains gluten, a nitrogenous body, and a small amount of fat. White bread is easier to digest than brown bread. Various articles are made from flour: sago, macaroni, biscuits.

(*b*) Vegetables (rice, potatoes). They contain chiefly starch and sugar.

(*c*) Green vegetables (cauliflower, asparagus, turnips, cabbage, carrots, spinach, string beans) are especially rich in salts.

Almost all vegetables are not eaten in their raw state, but after being cooked. The cooking produces the necessary effect of rendering them softer so that they can be more readily broken up in the mouth. It also causes the starch grains to swell up and burst and so aids the digestive fluids in penetrating into their substance. The albuminous matter is coagulated and the gummy, saccharine, and saline matters are removed. The conversion of flour into dough is effected by mixing it with water and adding a little salt and a certain amount of yeast. It is by the growth of the yeast which lives upon the sugar produced from the starch of the flour that a quantity of carbonic-acid gas and alcohol is formed. By means of the former the dough rises. By the action of heat during baking the dough continues to expand, and the gluten being coagulated, the bread sets as a permanently vesiculated mass.

(*d*) Fruit (pears, apples, etc.). They all contain sugar and organic acids like tartaric, malic, citric, and others.

C. Liquid Foods.

Water is consumed alone or together with certain other substances added for flavoring purposes, tea, coffee, etc.

Tea in moderation is a stimulant and contains an aromatic oil to which it owes its peculiar aroma, an astringent of the nature of tannin, and an alkaloid, theine. The composition of coffee is very similar to that of tea. Cacao, in addition to similar substances contained in tea and coffee, contains fats, albuminous matter, and starch, and must be looked upon more as a food.

Beer in various forms is an infusion of malt (barley which has been sprouted and the starch of which is converted in great part into sugar) boiled with hops and allowed to ferment. It contains from one to eight per cent of alcohol.

Cider is the fermented juice of apples ; wine the fermented juice of grapes and contains from six or seven (Rhine wine and white and red Bordeaux) to twenty-four per cent (Ports and Sherries) of alcohol. Spirits obtained from the distillation of fermented liquors contain upward of forty to seventy per cent of absolute alcohol.

Utilization of Food.

The amount of utilization of the food by the digestive tract has been studied by Rubner, and according to his investigations the residues of the different food-stuffs, that is, the indigestible matter, are least under a diet of animal food and highest under one consisting of vegetables. He gave the following scale: Meat, eggs, macaroni, white bread, milk, rice, maize, carrots, cabbage, potatoes, brown bread.

Diet in Health.

The diet in health should not always comprise the most easily digestible substances. For by doing so we weaken our digestive system. Although it is not necessary always to choose the substances which are hard to digest, it is certainly not necessary to avoid them. The food should consist of mixed substances (easy and difficult to digest) and should always present a sufficient variety. As to the distribution of meals and also as to the predominance of the different food articles in diet it is impossible to give the same rule for all. Good use and custom is the best and most important guide.

Dietetics in Diseases of the Stomach.

Within the past five years important facts have been discovered which are of the greatest value in the treatment of diseases of the stomach, and the influence of which can be perceived like a red thread through the whole chapter of dietetics. It has been shown by von Noorden[1] and others that emaciation in chronic diseases of the stomach is caused in the largest majority of cases—if not, perhaps, in all—not by specific poisons circulating in the organism, but by a smaller amount of food being taken. On the other hand, one might expect, judging from the universal law existing in the plant and animal kingdom of vicariousness or replacement in case of inability of the work of one organ by another similar one, that in grave disturbances of the digestive functions of the stomach the intestines would do the work instead. This has been experimentally, as well as clinically, proven in the most infallible way. Several authors (Leube, Ewald, von Noorden) have observed that, in cases of atrophy of the mucous membrane of the stomach in which the gastric secretion has entirely ceased, the patients can maintain their usual weight. In my paper on "Achylia Gastrica"[1] it is clearly shown that the patients can do very well without gastric secretion; under a proper regimen they can even gain in weight, and live long without any discomfort whatever. That means that even after the loss of the entire chemical action of the stomach, the gut is completely able to replace the function of the stomach.

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[1] Von Noorden: Berliner Klinik, Heft 55.

These two facts—(1) that the emaciation in chronic diseases of the stomach is caused by too small a quantity of food; (2) that even in grave lesions of the gastric functions the gut appears to perform vicariously the digestive work in a complete way—are of vital importance for the doctrine of dietetics. For it is seen at a glance that the main object of nutrition of the sick consists in giving them sufficient quantities of food.

As people with disturbances of the stomach have to replace for their existence no smaller losses than under physiological conditions, they will therefore need: 1. Just as large amounts. 2. The same kinds of foodstuffs as described for the normal state. The only difference possible will have reference to the selection of the various articles of food and to their form and special preparation.

Thus the question arises, What qualities should the food of the stomach patients possess?

In the treatment of a diseased organ one can often make use of two methods. One consists in sparing the diseased organ and giving it perfect rest, the other consists in strengthening the same by methodical adaptation for more work and practice. Both principles are in fact realized in the treatment of diseases of the stomach. The first method is ordinarily applied in acute diseases and but very seldom (and then only for a short time) in chronic affections of the stomach. In these latter the second principle, as a rule, is used. The stomach can be spared, firstly, by not introducing into it any food whatever (greatest degree of saving or rest). Secondly, by administering food substances which, during their stay in the stomach, do not impose much work upon this organ, and do not greatly irritate it. Here the main object will be to give the patient easily digestible food. In turning from the saving principle to that of strengthening the organ by methodical adaptation for work, it will be quite natural to change the diet, not suddenly, but gradually, into such as requires more work on the part of the stomach for its digestion. It is therefore absolutely necessary to have an exact table of the digestibility of different foods. In prescribing or changing a diet we shall have to act according to it. Such a scale has been arranged by different authors. The main sign of digestibility was gauged as mentioned above by the rapidity with which the various food-stuffs passed out of the stomach into the intestines. Beaumont, in many trials on his patient with the gastric fistula, determined the length of time the different victuals remained in the stomach and constructed a scale according to the figures obtained.

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[1] Max Einhorn: Medical Record, 1892.

On the same principle, but more reliable and of greater value, is the scale constructed by Leube, according to the results obtained by emptying the stomach of patients by means of a tube, after different kinds of food had been taken. We think it advisable and useful here to give Leube's scale:

1st Diet.—Bouillon, Leube-Rosenthal's meat solution, milk, soft raw eggs, zwieback, English cakes (biscuits containing no sugar), water, natural acidulous waters (Apollinaris, Kronthaler, Seltzer, etc.).

2d Diet.—Boiled calf's brain, boiled calf's sweetbread, boiled chicken (young without the skin), boiled pigeon, boiled calves' feet, tapioca pap boiled in milk, beaten white of egg.

3d Diet.—Raw beef (chopped very fine), raw ham (chopped very fine), beefsteak (superficially fried in freshest butter), finely scraped tenderloin of beef, mashed potatoes, white bread (stale), coffee with milk, tea with milk.

4th Diet.—Fried chicken, fried squab, roast venison, guinea hen, roast beef (cold), roast veal (leg, saddle), boiled pike, macaroni, rice pap, finely chopped spinach, asparagus, stewed apples.

This table has been verified by the above-mentioned Penzoldt's investigations. All these experiments, however, only show what food remains in the stomach the shortest time. This would perhaps give reason for inferring what food may be easily digested as far as the stomach is concerned, but not what is more easily digested as a whole, *i.e.*, made use of for the economy of the body with the smallest amount of work. The digestibility of food substances depends firstly upon their shape and quality; secondly, upon their percentage of convertible material.

"Corpora non agunt nisi fluida," is an old, well-known axiom. Following this law one could arrange the following scale of digestibility, which is constructed according to the different physical conditions of the food:

1. *Food in liquid form:* (*a*) Liquid at ordinary temperature—milk, meat juice, beef tea, bouillon, peptone or sarcopeptone dissolved in water, bread water,[1] strained barley, oatmeal, rice water, strained oyster soup, egg-albumin water; (*b*) liquid at the body temperature—jellies, fruit jelly, calf's-foot jelly, ice-cream, water-ice.

2. *Pulpy form.* The food is mechanically converted into very minute particles and well mixed in liquid—pap soups (barley, oatmeal, farina, rice, sago); egg in bouillon; Leube's meat solution, pulverized meat, pulverized crackers in milk, water, or bouillon; buttermilk, kumyss, cream, butter.

3. *Food which by slight trituration in fluids separates into minute particles:* White bread in milk or water; the tips of well-boiled asparagus; carrots, mashed potatoes, baked potatoes; the yolk of hard-boiled eggs; oysters (raw).

4. *Solid food.* White bread, rye bread; meat, hard-boiled eggs, fish, cheese.

5. *Substances not easily digested.* Meat with tough fibre; lobster; sausages and Swiss cheese on account of their solidity; all substances containing much cellulose, principally when eaten raw; cold slaw; all salads,

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[1] Bread water. Stale bread is cut into slices and put in water at temperature of room for from two to three hours, then the water is strained.

cucumbers, pickles, raw fruit, apples, pears, pineapple; fruit which contains much acid, therefore all unripe fruit, strawberries; substances containing much sulphur and forming gases in the intestines: all kinds of cabbage, principally white cabbage; beans.

This theoretically constructed scale of the digestibility of food is, at the same time, in the main points, similar to the one which has long stood the test of empiricism and which I ordinarily employ in my practice.

Dietetics in Acute Diseases of the Stomach.

Acute Gastric Catarrh.—The principle of rest here occupies the first place. In acute gastric catarrh, during the first two or three days, in which, as a rule, there is a total loss of appetite, only very little nourishment in liquid form should be given, containing principally amylacea, barley or oatmeal soup, bouillon, weak tea, water. As a rule, one must not force a patient to take food during the first or even during the second day of sickness. The anorexia in these conditions is a wise arrangement made by nature in order to give the stomach rest. If there is thirst, beverages may be taken in small quantities, and must be neither very cold nor very warm. As soon as the appetite reappears one may give some toasted bread or zwieback, milk, soft-boiled eggs or oysters, permitting after a while small quantities of bread and meat, and then passing slowly to the ordinary diet.

Ulcer of the Stomach.—During the rest cure of von Ziemssen-Leube give liquid diet, consisting principally of milk, for two or three weeks. As is well known, Cruveilhier[1] first recommended milk for the purpose, and even now there are some physicians who limit themselves to milk alone. As a rule, however, it is appropriate to allow, besides milk, milk in combination with barley, oatmeal, or rice water. In addition to this, the different peptone preparations are here in place. I administer Rudisch's sarcopeptone, manufactured in this country, on account of its being palatable and highly nourishing. (The Rudisch's sarcopeptone contains forty per cent of nitrogenous substances, including twenty per cent of peptones.)

One may give most appropriately every three hours one to two cupfuls of milk with the addition of the above-named decoctions (four times daily) and sarcopeptone (twice daily). The patient must not drink these fluids, but eat them with a spoon. In case of hemorrhage of the stomach during the first three or four days, it is not permitted to give any food whatever by the mouth; instead, the patient must be fed by the rectum. Ewald has proven that the large intestine has the ability of digesting and absorbing albuminates even without special previous preparation; therefore the following may be given as a nutritive enema:

1. Three to five eggs are mixed with 150 c.c. of sugar water (30 gm. of grape sugar dissolved in 150 c.c. of water), a small quantity of common table salt is added, and the whole mixture well beaten; one may add also a small quantity of starch solution or mucilage.
2. One-half pint of milk with two eggs and 50 gm. of grape sugar added.

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[1] "Anatomie Pathol.," 1829–35.

3. One and a half tablespoonfuls of Rudisch's sarcopeptone dissolved in a cupful of water.

The food enemata have to be given three or four times daily. It is necessary that the fluid should be at the temperature of the blood, and that it should be injected by means of a fountain syringe and a soft-rubber rectal tube. Each time before giving a nourishing enema a cleansing enema of 250 c.c. of lukewarm water has to be administered, in order thoroughly to cleanse the large intestine and make it more fit for absorption. In order to facilitate the retention of the feeding enema W. Gilman Thompson[1] suggests the following procedure: Upon withdrawing the tube, if there is danger that the injection will not be retained, a soft compress or folded towel should be pressed up firmly against the anus for twenty minutes or half an hour. In case of thirst the patient is allowed to take small pieces of ice into the mouth from time to time. Thirst and hunger, however, may be entirely relieved by nutrient enemata alone. "In an obstinate case of gastric hemorrhage in which absolutely nothing, not even water, was given by the mouth for more than a week," W. Gilman Thompson[2] says, "I questioned the patient in regard to her sensations of hunger and thirst, and she told me that they were entirely relieved after the first twenty-four hours' use of nutrient enemata. The mouth and tongue were not dry and she did not lose weight during this period." Three days after the disappearance of blood one slowly and cautiously begins the liquid diet.

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[1] W. Gilman Thompson: "Practical Dietetics, with Special Reference to Diet in Disease," New York, 1895.

[2] W. Gilman Thompson: *l. c.*

Dietetics in Chronic Affections of the Stomach.

While in acute diseases of the stomach we pay most attention to giving rest to the organ—for here even an insufficient nutrition and the loss of several pounds of bodily weight are not of much importance, as the quickly recuperating organism replaces the losses caused during the sickness by taking increased quantities of food—in the chronic affections it is of utmost and vital importance to see that sufficient quantities of food are taken.

The greatest number of stomach patients consulting the physician, after the disease has been progressing quite a while, have lost more or less weight. The principal reason for this lies in the fact that the body has received too small a quantity of nourishment in order to replace the waste.

The ordinarily insufficient appetite, the early appearance of a feeling of satiation, the pain often appearing after meals, and less frequently vomiting, are the principal factors of subnutrition.

At this point it becomes necessary to divide the patients with stomach troubles into two large classes:

1. Into those with organic lesions of the stomach.
2. Into those with functional disturbances.

The first class comprises, (*a*) the malignant diseases of the stomach itself or its orifices (carcinoma ventriculi, cardiæ, pylori); (*b*) cicatricial strictures of the cardia or pylorus; (*c*) absence of secretory work of the stomach: achylia gastrica.

In this whole first class, with the only exception of group *c*, which lies, so to speak, between the first and second class, we are unable to accomplish much either by medicinal treatment or dietetics. In existing strictures of the cardia or pylorus it will be necessary to seek surgical aid. Even in cancer of the stomach wall the resection of the affected part is advisable whenever the operation is possible. I cannot refrain from calling attention at this place to the splendid results of the recent stomach surgery, which of late has been frequently practised in our own country (F. Lange, N. Senn, R. Abbe, Willy Meyer, McBurney, Weir, Bull, Gerster, Roswell Park, Murphy, and others). In carcinomatous strictures a new passage can be established, either for bringing food into the stomach, by a gastric fistula, or for allowing it to pass into the intestines, by gastro-enterostomy. In this way we succeed at least in temporarily giving these unfortunates relief and in ameliorating their nutritive condition. In the cicatricial strictures we are warranted in promising to the patients, nowadays, perfect recovery by undergoing operative treatment. (In strictures of the cardia a methodical dilatation with bougies may sometimes also suffice.) The pyloroplastic operation (of Heincke-Mikulicz) and the cardiotomy or cardio-fissure (Abbe) belong to the most beautiful and blissful operations which have ever been practised. After the operation the patients are enabled to eat everything, and to live without any trouble whatever, *i.e.*, they are perfectly cured.

Before the operations, or if such are unfeasible, one should administer light, very slightly irritating nourishment, and always endeavor to make the patient partake of a larger quantity of food. If there is obstinate and constant vomiting, it is necessary to employ nutritive enemata.

Group (*c*) achylia gastrica will be advantageously discussed in regard to diet under Class 2.

The second class of functional disturbances includes the largest number of all dyspeptics. Here stand uppermost chronic gastric catarrh, atony of the stomach, dilatation of the stomach, gastroptosis, superacidity, with or without hypersecretion, nervous gastralgia, nervous dyspepsia, and as an intermediary between the first and second class, achylia gastrica.

It appears advisable to discuss first the whole class, and thereafter to give special rules for the different groups. Liquid food or partly predigested substances (as all peptone preparations) are not in place here. By making the stomach work too little, the weakened condition of this organ is retained and aggravated in time. We must always bear in mind the principle of strengthening the organ by means of appropriate work.

A well-known clinician is said to express himself in his lectures in the following way regarding the dietetics of the dyspeptic:

When a dyspeptic patient asks you the question, "What shall I eat?" reply, "Eat what you like." If he asks, "How much shall I eat?" say to him, "Eat as much as your appetite demands." If he still asks, "When shall I eat?" answer, "Eat when you are hungry."

Although I do not favor strict and severe dietetic rules, nevertheless I deem the above-mentioned remarks as going too far. Unlike the normal healthy condition, in which instinct shows us the right measure to eat, neither too little nor too much, stomach patients very often have lost the feeling of self-regulation, and as a rule partake of too small quantities of food. (Only in a few cases of bulimia there may be an increased desire for food, and in connection with it the quantity of food taken may sometimes be too large.) It is therefore necessary to instruct the patients to eat more, or to give them exact figures of the quantity of food required. As this varies with every individual it is most practicable to let the patient weigh himself once a week and to see whether he keeps his weight. If the patient does not lose any it is the best sign that he takes sufficient nourishment. As good instances of a sufficient amount of food contained in the diet we give the following bills of fare which have been suggested by C. von Noorden:[1]

I. A PRINCIPALLY MILK DIET WITH ADDITION OF CARBOHYDRATES IN LIQUID FORM.

	Albumin, per cent.	Fat, per cent.	Carbohydrate, per cent.	Calories, per 100.
Milk, 1,700 cc	70.2	66.3	69.7	1295
Soup of tapioca flour, 30 gm. and 10 gm. albumose.[2]	10	....	30	164
Soup of 40 gm. wheat flour, with some of the milk, 10 gm. sugar and one egg..................	7.0	5.5	40	244
Total......................	87.2	71.8	139.7	1703

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[1] C. von Noorden: Berl. Klinik, 1838, J. 55.

[2] 10 gm. albumose is contained in 90 cc. of Denayer's peptone preparation or in 22 of Kemmerich's or in 30 of Koch's.

II. PRINCIPALLY MILK DIET WITH THE ADDITION OF CARBOHYDRATES AND FAT IN PAP FORM AND SOUPS.

	Albumin, per cent.	Fat, per cent.	Carbohydrates, per cent.	Calories, per 100.
Milk, 1,500 c.c	62	58.5	63	1056
Soup of 15 gm. sago, 10 gm. butter, one egg, 10 gm. albumose.	17	13.5	15	257
Pap of 80 gm. corn flour, one egg, 10 gm. sugar (two meals).	7	5.5	90	398
Total	86	77.5	168	1711

III. MILK DIET WITH ADDITION OF LIGHT PASTRY AND BROTHS.

	Albumin, per cent.	Fat, per cent.	Carbohydrates, per cent.	Calories, per 100.
Milk, 1,250 cc	51	49	52	878
Meat broth with one egg, 10 gm. of butter, 50 gm. of fine toasted wheat bread.	10	14	30	294
Cakes 70 gm., butter 15 gm	5	12	50	337
Soup of 30 gm. tapioca flour, one egg, 10 gm. butter.	7	14	30	282
Total	73	89	162	1791

IV. MILK WITH TENDER MEAT, PASTRY, BUTTER, AND SOUPS.

	Albumin, per cent.	Fat, per cent.	Carbohydrates, per cent.	Calories, per 100.
Spring chicken, 100 gm	19.6	2.8	....	106.4
Mashed potatoes, 100 gm	2.0	4.0	20	127.4
Two eggs	14.1	11.0	....	160.1
Toasted wheat bread, 100 gm	7	0.5	55	258.8
Butter, 30 gm	....	23.0	....	213.9
Trout, 100 gm	19.3	2.1	....	106.4
Milk, 1250 cc	51	49	52	878
Total	113.0	92.4	127	1851

V. Rich, not Irritating Diet.

	Albumin, per cent.	Fat, per cent.	Carbo-hydrates, per cent.	Calories, per 100.
Tender meat,[1] 250 gm.	49	7.0	....	266
Cacao, 20 gm	4	6.0	8	105
Three eggs	21	16.0	....	235
100 gm. Zwieback	8	1.0	75	259
100 " wheat bread	7	0.5	55	....
50 " cakes	4	2.3	36	187
50 " butter	....	44.0	....	407
40 " tapioca flour	....	....	40	164
40 " corn flour	....	....	40	164
20 " sugar	....	....	20	82
1250 cc. milk	51	49	52	878
Total	144	126.0	318	2747

Besides the importance of a sufficient diet, we must remind patients to lead a regular life, to eat slowly (how many, especially in our country, sin against this natural law!), and to chew well and triturate the food. One must avoid either extremely cold or extremely warm food. Too copious and too complicated meals must be strongly forbidden.

I have made it a rule not to forbid anything, except what is, according to my conviction, obnoxious in the given case. In this way the patients have a great variety in their food and run less risk of subnutrition. Likewise we need not change the number of meals nor the hours appointed unless there should be especial indications for such a proceeding.

Among the laity, as well as often among medical men, there are prejudices against certain forms of food. Thus, for instance, until recently it was customary to forbid all kinds of fat, even butter, in all dyspeptic conditions. Fat, however, belongs to the group of food-stuffs which has the largest number of heat units, and besides, is not bulky as a nourishment (butter). Undecomposed fat passes the stomach without molesting the latter, and is digested in the small intestines. There is, therefore, no reason for forbidding butter, which should, on the contrary, be highly recommended. Fearing fermentative processes the partaking of bread and other food rich in carbohydrates is very often greatly limited, or even totally forbidden. Although it is true that the carbohydrates easily undergo fermentative processes, those cases, however, in which considerable fermentations exist in the stomach are quite rare, and as a rule are found only where there is considerable stagnation of food in the stomach. In these cases, to be certain, a diet consisting principally of animal albumin (meat) for a short period is very useful. By means of lavage of the stomach and other appropriate treatment we soon succeed in checking the fermentative processes, and carbohydrates can then be administered.

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[1] Meat of various kinds, finely chopped, raw or fried in butter; cold or warm, taken at two meals.

An adult, according to Koenig,[1] daily consumes ⅓ to ¾ kgm. of bread; fifty to sixty per cent of the total food substances, and fifty to seventy-five per cent of the carbohydrates are taken in the form of bread. This clearly shows the important part bread takes in diet. Its use is, therefore, as a rule advisable. It is ordinarily said that crust of bread, stale bread, and zwieback are easier to digest, on account of the starch contained in them being largely converted into dextrose. Although I am of the opinion that too fresh bread must be avoided, I nevertheless rarely find much difference in the digestibility of the crust or other parts of well-baked fine white bread, judging from experience gained from my own patients.

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[1] Koenig: "Die menschlichen Nahrungs- und Genussmittel," Berlin, 1883, p. 430.

Articles of luxury (wine, beer, coffee, tea) are, as a rule, permissible. It is, however, necessary to give them in small amounts and in appropriate form. Strong liquors must be avoided, likewise all strong spices.

Appetizers, as a small amount of caviare, sardellen, or anchovies, on a small slice of bread or cracker, taken one-quarter of an hour before the meal, are not only allowed but frequently directly commendable.

In reference to the special rules for the different diseases of the second class, we shall have at times to reduce the quantity of meat taken in all conditions accompanied by a diminished secretion of hydrochloric acid (gastritis chronica glandularis, atony + subacidity); on the other hand, the quantity of richly carbohydrate vegetable food must be increased. Kumyss, matzoon, milk with cognac (7 to 10 c.c. of cognac to 200 or 250 c.c. of milk) may be taken with crackers either during or between meals.

In all the conditions attended with superacidity the quantity of albuminous food should be increased; here one may give a great deal of meat (venison included). In superacidity with hypersecretion frequent and small meals containing consistent food are most appropriate. If there is a feeling of hunger between meals, the white part of hard-boiled eggs may be taken (as is well known, albumin combines with acid and makes it, so to say, inert). The quantity of beverages must be greatly limited; most suitable in this instance are small quantities of Vichy water. In dilatation of the stomach and in gastroptosis it is also advisable to give small and frequent meals, and to restrict the quantity of liquids taken. As a rule, milk and beer do not agree well in these cases. Small quantities of wine or imported dark beer or porter may be allowed.

In nervous dyspepsia and gastralgia our main object will be to systematically increase the quantity of food —here milk and its derivatives (koumyss, matzoon, bonny-clabber, buttermilk, cream) taken between meals play a great part (Weir Mitchell treatment).

In achylia gastrica it is of utmost importance to give liquid or very well triturated (pulverized) food. For here the chemical action of the stomach has entirely ceased, and vegetable (on account of the albuminous membrane enclosing the starch granules) as well as animal food pass from the stomach unchanged, and not converted into small particles, into the intestines and irritate them, unless there has long been formed a sufficient adaptation for these conditions. Vegetable food, on account of its containing chiefly carbohydrates, will be predominant in the diet of this affection. Thus achylia gastrica, in reference to diet, stands midway between the first and second classes. It approximates the first class in so far that it necessitates a liquid or mechanically minutely triturated or pulverized food, the second class in allowing a richly carbohydrate diet.

Some readers may miss exact bills of fare for chronic affections of the stomach. They have been omitted, as it is always necessary to individualize, especially in diet. We must guide ourselves more by the patients than by theoretical conclusions. Our main object must be to care for a sufficient nutrition. Only the above-given principal rules on diet must be observed, although at times even they have to be modified. In reference to this point Hippocrates[1] said: "*Dandum aliquid tempori, regioni, ætati et consuetudini.*"

At present, with our more exact knowledge, we have come to appreciate this conclusion to a still greater degree.

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[1] Cited from Munk and Uffelmann, *loc. cit.*, p. 480.

CHAPTER IV.

LOCAL TREATMENT OF THE STOMACH.

1. *Lavage.*

GASTRIC lavage, which is so frequently employed in the treatment of diseases of the stomach at the present day, was first introduced by Kussmaul[1] in 1867, who used for this purpose the stomach pump. Previous to that time this method had been practised by Bush, Arnott, Sommerville, and Blutin,[2] but to Kussmaul belongs the credit of employing it in a rational and scientific manner. The illustration (Fig. 33) affords an idea of the mechanism of the instrument employed by the latter observer which, however, is now only of historical interest, since it has been supplanted by simpler apparatuses based upon the principle of siphonage.

(*a*) *Funnel Arrangement.* The one that is most commonly in use consists of a glass funnel attached to a piece of soft-rubber tubing of about one yard in length which can be slipped over the upper end (connecting glass tube) of the stomach tube. By filling the funnel with water, and alternately raising and lowering the same, the stomach may be filled or emptied. The funnel, as a rule, is not very large and has a capacity of about 300 to 500 c.c. Ewald[1] advises the use of a very large funnel of about two quarts capacity. This rests in a wooden frame on the floor and after being filled with the requisite amount of water is then raised to a height suitable to obtain the amount of pressure desired. The water escapes from the various openings in the tube as from a sprinkler, and the stomach is in this way irrigated. To siphon the water out of the stomach, the funnel is again placed in the wooden frame, and thus the fluids of the stomach return. Here the whole quantity of the wash-water can be easily inspected.

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[1] Kussmaul: "Ueber die Behandlung der Magenerweiterung durch eine neue Methode mittelst der Magenpumpe." Deutsches Archiv f. klin. Med., vol. vi., p. 455.

[2] See Ewald: "The Diseases of the Stomach," New York, 1892, p. 5.

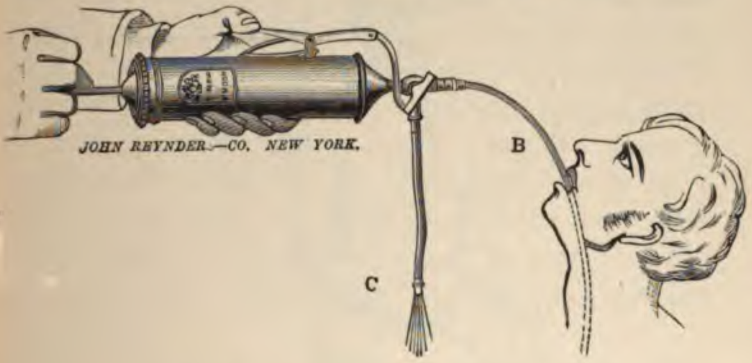

FIG. 33.—Kussmaul's Stomach Pump.

(*b*) *Leube-Rosenthal Apparatus.* The raising of the big funnel is quite troublesome, and I therefore prefer to use in my own practice the Leube-Rosenthal apparatus which I consider the best means of washing the stomach (see Fig. 34). This consists of a large glass irrigator of about two to three quarts capacity. Leading from the irrigator a large piece of soft-rubber tube is connected by means of a **Y**-shaped glass tube first with the stomach tube, secondly, with another quite long piece of soft-rubber tubing. Both arms of tubing, the one running from the irrigator the other into a waste vessel, are provided with

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[1] C. A. Ewald, *l. c.*, p. 64.

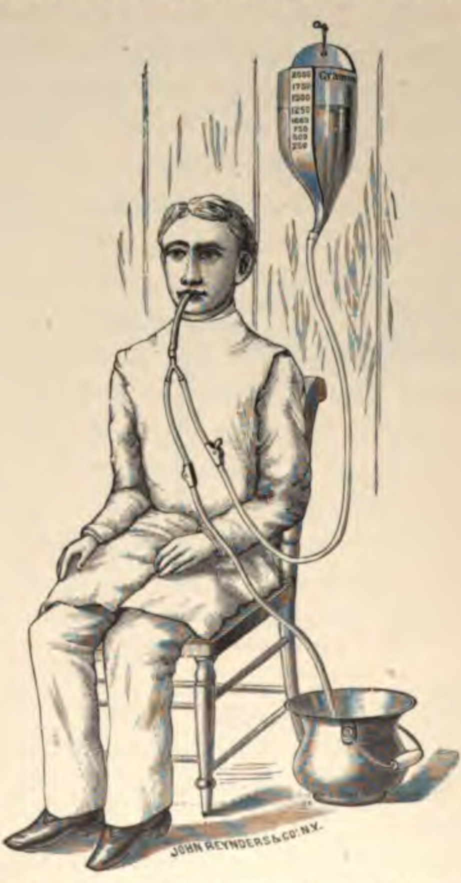

FIG. 34.—Leube-Rosenthal Apparatus for Gastric Lavage.

clamps. By opening the clamp on the irrigator tubing, the water runs into the stomach. By closing the same and opening the tube running to the waste vessel, the water is withdrawn from the stomach. The amount of water which is used for each single filling of the stomach may vary from 400 c.c. to a litre. The stomach may be filled with water so long as the patient does not experience any pressure. As soon as he begins to feel some pressure, the quantity should not be increased, but at once withdrawn. This manœuvre can be repeated twice or three times at each sitting. In case large quantities of mucus are present in the wash-water, it is best to have the patient shake himself, especially his abdomen, while the water is entering the stomach. In this way it is possible to mechanically clean the organ much more thoroughly than would otherwise be the case. The same method of shaking has to be applied if the stomach contains some food.

The advantages of this apparatus are quite manifold:

1. The ease with which the whole procedure can be executed.

2. The water introduced into the stomach is always clear, as the waste water passes through a separate tube; while in the use of the funnel arrangement after the first filling the funnel and the tubing become soiled during the withdrawal of the contents, and in consequence of this, during the second filling, much of the mucus which has remained within the apparatus returns to the stomach.

(c) *Friedlieb's Apparatus.* Another very suitable arrangement for washing out the stomach, especially if the patient has to perform the procedure himself, is an apparatus that has been in use in this country for many years, and is similar to the one described by Friedlieb.[1] It consists of a long piece of soft-rubber tubing of about two yards in length, the middle of which is expanded into a bulb. The stomach end of the tube is provided with two big openings, while the other is shaped into a funnel (see Fig. 35).

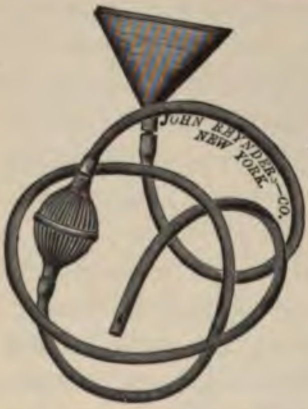

Fig. 35.—Friedlieb's Apparatus for Gastric Lavage.

In the withdrawal of the gastric contents with this apparatus the tube should be closed with two fingers at a point situated between the bulb and the lips of the patient. If the bulb is now compressed, and the two fingers applied to its distal side, then on relaxing the pressure on the bulb it will become filled with stomach contents. By again closing the upper end of the tube and compressing the bulb, the contents will flow out from the apparatus. In this way the contents of the stomach can be removed. The washing of the organ is now executed in the usual way by filling the funnel end with water, raising the same and lowering again. The bulb then need not be compressed if the water flows out easily. If the stream of water stops flowing before the entire quantity has left the stomach, then suction by means of the bulb must be performed as above described. Instead of using the fingers in order to compress the tube, two clamps on both sides of the bulb may serve the same purpose.

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[1] Friedlieb: Deutsche med. Wochenschrift, 1893, No. 51.

(*d*) Several writers have tried to wash out the stomach by means of a tube *à double courant.* Very recently J. C. Hemmeter[1] in this country anew devised such an apparatus for this purpose. According to my opinion, however, all these devices are unnecessary. Lavage of the organ cannot be accomplished more thoroughly by means of these than by the three above-described simple apparatuses.

A Few Rules Concerning the Application of Lavage.

The introduction of the tube has to be performed as above stated, when we spoke of the introduction of the tube for the withdrawal of gastric contents for examination. During the introduction of the tube, it is necessary to have the patient hold his head slightly bent forward (as a rule, patients try to throw their heads far back, which is a great obstacle to the entrance of the tube into the œsophagus). The insertion of the tube has to be done quite rapidly. During the entire procedure it is best to have the patient breathe deeply. It is furthermore of importance to hold the tube with the hand not far from the mouth of the patient in order that the apparatus may not move up and down and in this way cause irritation of the stomach and produce nausea and spells of vomiting. In case the outflow of the fluid is suddenly arrested (by food particles obstructing the opening of the tube), a small quantity of water has to be poured in again, and the siphoning repeated. How long and how often the stomach should be washed out is difficult to define. As a rule, this procedure should be kept up until the water returns quite clear. The appearance of blood in the wash-water necessitates the withdrawal of the tubing. If, however, only a few blood stains are visible in the water, they are of no import, and the lavage can be continued.

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[1] J. C. Hemmeter: New York Medical Journal, March 30th, 1895.

Indications.

Aside from diagnostic purposes lavage must be performed (1) when there is stagnation of food in the stomach; (2) whenever large quantities of mucus are present in the organ.

Contra-indications.

These comprise all conditions in which introduction of the tube is not permissible, as for instance, hemorrhages, ulcer of the stomach, etc.

2. *The Gastric Douche* (*Malbranc*).[1]

By the gastric douche is meant a sprinkling of the stomach with water under high pressure. This can be done by raising the funnel of the washing apparatus to a considerable height. Ewald's tube, which has several small openings and one large one, is most suitable for this purpose. Rosenheim[2] likewise makes use of a similar tube. Boas employs a tube with many small openings of pinhead size. The latter, however, has the disadvantage that the water cannot return quickly. The gastric douche was applied by Malbranc and afterward by the above-named writers in order to combat severe gastralgias.

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[1] Malbranc: Berl. klin. Wochenschr., 1878, No. 4.

[2] Th. Rosenheim: "Ueber die Magendouche." Therapeutische Monatshefte, 1892.

According to my experience there is but little difference between lavage and douching of the stomach. In fact, every form of lavage has almost the same effect as the gastric douche. Of late M. Gross,[1] of New York, has devised a double-current gastric douche.

Both lavage and the gastric douche have been made use of for the application of medicaments directly to the mucous membrane of the stomach. Thus, for instance, various antiseptic solutions have been applied (boracic acid, salicylic acid, sodium salicylate, thymol, creolin, lysol, etc.). Again, chloride of sodium on the one hand, and nitrate of silver on the other (the one to increase, the other to diminish gastric section) have been used by Boas and Rosenheim.[2]

The solution introduced into the stomach by means of the apparatus is left there for a few minutes (two to five) and then withdrawn. This procedure has the great disadvantage that in order to apply a solution in the right concentration, covering the whole inside of the stomach, a considerable quantity of the medicament is absolutely necessary. The quantity of the agent has to exceed the normal dose, and reach the poisonous limit. Although by emptying we certainly remove the greatest part of the solution and in this way the danger of intoxication is greatly diminished, nevertheless a considerable quantity of the injected fluid may pass through the pylorus into the intestines beyond our control and at times may do harm. That is the reason why nitrate of silver and similar poisonous substances should not be introduced into the stomach by these means.

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[1] M. Gross: Medical Record, 1895.

[2] Rosenheim: *L. c.*

3. *The Gastric Spray* (*Einhorn*).

In cases in which it is necessary to apply medicaments of a toxic or irritating character to the gastric mucosa, the risk of poisonous effect can be prevented by the use of the spray, by means of which large surfaces can be covered with a comparatively small amount of fluid.

In order to make use of the spray in diseases of the stomach, the usual spray apparatus has been modified by me in such a way that, instead of the hard-rubber branch of the apparatus, the same branch is made of soft-rubber and lengthened. In this way the gastric spray apparatus consists of the usual spray apparatus, in which there is a soft Nélaton tube, of 70 cm. length, inserted between the nozzle and the hard-rubber branch running to the bottle; within the Nélaton tubing, another soft tube of thinner calibre connects the inner capillary tube with the nozzle (see Fig. 36).[2]

As the spray is generated by the air forced by the bulb through the tube, taking up the fluid and dividing it into fine particles, the medicament will necessarily come in contact with every part touched by the air.

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[1] Max Einhorn: "The Use of the Spray in Diseases of the Stomach." New York Medical Journal, September 17th, 1892.

[2] The gastric spray apparatus is manufactured by J. Reynders & Co., 303 Fourth Avenue, New York.

If the stomach is empty when spraying, the air that enters will expand the organ and transport the fluid to every part of its interior.

The administration of the spray in gastrotherapeusis is a suitable form for fulfilling the following purposes:

1. To disinfect the mucous membrane of the stomach.

2. To exert an astringent effect.

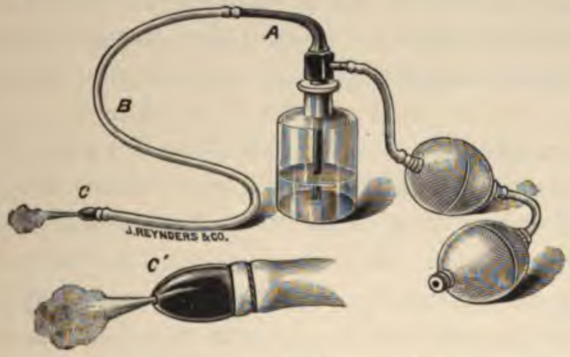

FIG. 36.—The Gastric Spray Apparatus (Einhorn).

3. To produce analgesia in gastralgia of local character (from ulcer, cicatrix, or cancer).

Method.—As it is possible to spray the stomach only in its empty state, it will be necessary to administer the spray either when fasting or after a previous lavage.

A preceding lavage will always be indicated if we intend to disinfect or apply astringents, for in these instances it is necessary first to remove the mucus with the micro-organisms embedded therein. In order to exert an analgesic influence, the lavage may perhaps be omitted.

After filling the apparatus with a sufficient amount of the required solution, the tube end is dipped into warm water and thereupon inserted into the stomach of the patient. It is best to begin with the spray as soon as the nozzle (being in the stomach) is at a distance of about 45 cm. from the lips of the patient. Provided the nozzle is not covered by the stomach wall, there can be heard during the spraying, at times in the neighborhood of the patient—otherwise by putting the ear on the gastric region—the sound characteristic of the spray. In case the opening is covered, the spray is generally unable to pass, and it is then necessary to insert the tube a little farther.

Even if the spray works well from the beginning, it will be expedient after a while to introduce the tube a little farther, in order to have the spray work from different points. The spraying of the stomach has proved very useful, according to my experience, in the following conditions: (1) In erosions of the stomach; (2) in those forms of chronic gastric catarrh which are associated with an abundant amount of mucus; (3) in cases of hypersecretion and hyperacidity.

4. *Electricity.*

In view of the firm foothold gained by electricity in the therapeusis of gastric and intestinal disorders, it will not appear superfluous to give a brief review of the history and physiological action of this agent with reference to the digestive tract.

Numerous experiments have been made in the study of the influence of electricity upon the stomach and intestines; all of them serve to demonstrate the physiological effects of this agent.

Ludwig and Weber,[1] von Ziemssen,[2] and Bocci[3] have stated that in animals the faradic, as well as the galvanic, current, applied directly to the stomach, causes contractions of this organ, and produces secretion of gastric juice.

Schillbach,[4] upon applying the galvanic current to the bowels of a rabbit, observed intense contractions at the site of the anode, followed by peristaltic movements. Fubini[5] lately demonstrated, after making a Vella's double intestinal fistula, that electricity quickens intestinal peristalsis to a high degree, viz., about five or six times.

The influence of electricity upon the stomach and intestines thus being evident, many authors endeavored to make use of this means in the therapeutics of these organs.

For many years past numerous writers have employed electricity in affections of the stomach and intestines. The method generally used for this purpose consisted in the percutaneous application of the current; usually one electrode was held in the neighborhood of the vertebral column at about the sixth dorsal vertebra on the left side, the second electrode being placed at the epigastrium.

A. D. Rockwell and M. Beard[6] were among the first to make use of electricity on a large scale in the treatment of nervous dyspepsias. To the application of electricity to the stomach they added general electrization, and had the most brilliant results.

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[1] Ludwig and Weber: Cited from Kussmaul, Arch. f. Psych. und Nerv., 1877, Bd. viii., p. 205.

[2] Von Ziemssen: Klin. Vorträge, No. 12, "Die Electricität in der Medicin."

[3] Bocci: Lo Speriméntale, June, 1881.

[4] Schillbach: Virch. Arch., Bd. 109, p. 284.

[5] Fubini: Centralbl. f. d. med. Wissensch., 1882, No. 33, p. 579.

[6] A. D. Rockwell and M. Beard: Philad. Med. Surg. Report., 1868, No. 20, and 1871, p. 470.

Neftel[1] likewise had much success from the electrical treatment.

Fuerstner[2] recommends the galvanic current for the treatment of atonic dilatations of the stomach.

Oka and Harada,[3] Leube,[4] Lente,[5] Semmola,[6] Ritcher[7] and Leubuscher,[8] speak highly of the application of the electric current in various pathological conditions of the stomach and intestines.

Besides these clinical facts, there have lately been added some more exact notes as regards the physiological effects of percutaneous electricity of the stomach in man. Ewald and myself[9] have been able to demonstrate an acceleration of the motor faculty of the stomach under the influence of percutaneous faradization, by the appearance of the salol test in the urine about one-fourth of an hour earlier than otherwise. A. Hoffmann[10] showed that the galvanic current percutaneously applied in the gastric region for twenty minutes produces an abundant secretion of gastric juice.

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[1] Neftel: Centralbl. f. d. med. Wissensch., 1876, No. 21, p. 370.

[2] Fuerstner: Berl. klin. Wochensch., 1876, No. 11.

[3] Oka and Harada: Berl. klin. Wochensch., 1876, No. 44.

[4] Leube: Deutsch. Arch. f. klin. Medicin, 1879, tome 23, p. 98.

[5] Lente: Arch. of Electrol. and Neurol., 1874, i., p. 193.

[6] Semmola: "L'elettricità nel vomito." Gaz. med. Ital. Lombard., 1878, No. 6.

[7] Richter: Berl. klin. Wochensch., 1882, Nos. 13 and 14.

[8] Leubuscher: Centralbl. f. klin. Med., 1887, No. 25.

[9] Ewald and Einhorn: Verhandlungen des Vereins für innere Medicin, 1888, p. 58.

[10] A. Hoffmann: Berl. klin. Wochensch., 1889, Nos. 12 and 13.

Direct Electrization of the Stomach.

Although the favorable influence of electricity, even percutaneously applied, is quite evident in numerous affections of the stomach and intestines, it, however, remains questionable whether any of the produced electricity penetrates to the stomach. The main currents undoubtedly go through the skin and muscles, and if any of them reach the stomach, they must be very weak. But surely we might expect to attain better and more successful results by the application of electricity directly to the stomach. In his celebrated book on "Electrotherapy" Erb[1] says: "The first maxim to observe is the treatment in *loco morbi*, *i.e.*, the application of electricity to the morbid part itself. . . . There is no doubt that it is best, in the great majority of cases, to operate directly on the diseased spot."

Pepper[2] had a patient with dilatation of the stomach, in whom the abdominal walls were so thin that the spontaneous peristalsis of the stomach could be perceived. On this patient he showed that electricity, percutaneously applied, never produced any peristaltic movements of the stomach.. Pepper then continues as follows: "The difficulty of compelling a current, no matter what may be its strength, to penetrate through various layers of tissue of different consistence and anatomical character is well known." Speaking of the percutaneous electricity of the stomach, Kussmaul[3] remarks: "The therapeutic results obtained by Fuerstner and others in cases with dilatations of the stomach do not prove that by means of the current a direct peristalsis of the stomach was induced, but could be attributed to the favorable influence of the contractions of the abdominal walls." All the sentences mentioned plead for applying electricity to the stomach directly, and not percutaneously, if possible.

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[1] Erb: "Handbuch der Electrotherapie," p. 279.

[2] Pepper: Philadelphia Medical Times, May, 1871, p. 274.

[3] Kussmaul: Arch. f. Psych. und Nerv., 1877, viii., p. 205.

Canstatt[1] first proposed to combat dilatations of the stomach by direct electrization, introducing one electrode into the œsophagus and putting the other in the stomach region. Duchenne[2] was the first who made use of this method.

Kussmaul's Method.—Very soon afterward, in 1877, Kussmaul[3] began to practise the direct electrization of the stomach. The electrode used for the purpose consisted of a stomach tube, through which ran a copper wire ending in an olive point and fastened to the cut-off end of the tube. In several patients with dilatation of the stomach Kussmaul introduced this electrode into the stomach, the other (ordinary) electrode being held in the hand. In applying electricity in this way contractions of the abdominal muscles on the left side appeared, and in one patient, with thin abdominal walls, contractions of the stomach were visible on applying weaker electric currents.

Later on Balduino Bocci,[4] in 1881, experimenting on animals, was persuaded "that the indirect faradization of the stomach through the abdominal walls produces in the stomach, even when applied in a very energetic way, phenomena of very little importance, and of a dubious curative effect." As the direct faradization of the stomach, on the other hand, showed all the above-mentioned physiological effects, Bocci recommended anew the use of the direct electrization of the stomach for therapeutic purposes. Bocci used for this end an electrode like that of Kussmaul.

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[1] Canstatt: Cited from Kussmaul, *l. c.*

[2] Duchenne: Cited from Kussmaul, *l. c.*

[3] Kussmaul: *L. c.*

[4] Bocci: Lo Sperimèntale, June, 1881.

Bardet's Method.—Great progress in the direct electrization of the stomach was made in 1884 by G. Bardet.[1] The direct contact of the lower metal piece of the electrode with the inner wall of the stomach irritates only a small spot, and this very intensely, whereas the larger part of the stomach receives but very little of the electricity produced; in consequence thereof the galvanic current could not be applied, because by the usual method it would not be possible to avoid lesions of the mucous membrane of the stomach. In order to overcome these drawbacks Bardet constructed his stomach electrode in such a way that the metal piece running through the tube was shorter than the tube, and did not touch its windows. By filling the stomach with water the electric circuit between the stomach wall and the lower metal piece of the electrode was established. In this way the electricity was distributed over the whole surface touched by the water. By means of this electrode Bardet treated three cases of dilatation of the stomach, and one case of obstinate vomiting, with the galvanic current (15 to 25 milliampères) and obtained splendid results. Most authors who employed the direct electrization of the stomach have, until recently, generally used Bardet's electrode. (Charles G. Stockton's[1] stomach electrode does not differ very much from that of Bardet.)

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[1] Bardet: Bull. Gén. de Thérap., 1884, tome 106, p. 529.

Although the high value of the direct electrization of the stomach is self-evident, this method did not enter much into practice, because the tube surrounding the electrode had to be kept in the throat during the whole electric session (about ten minutes) and inconvenienced the patient to such a degree that the procedure could be carried out only in people accustomed to lavage of the stomach, and even by them it was disagreeably felt. That is the reason why von Ziemssen[2] rejected direct electrization of the stomach as being too straining and exhausting.

Einhorn's Method.

In order to facilitate the internal or direct electrization of the stomach I[3] have constructed an electrode on the same principle as the stomach bucket. This electrode once swallowed reaches the stomach without further artificial aid. The silk thread of the bucket is represented in the electrode by a very fine (1 mm. in diameter) rubber tube through which a very fine, soft, conducting wire runs to the battery. The end piece of the electrode consists of a hard-rubber capsule with many openings. In this capsule lies a metallic button which is connected with the wire. (Figure 37 shows the electrode in natural size.)

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[1] Charles G. Stockton: "A New Gastric Electrode," Medical Record, November 9th, 1889, p. 530.

[2] Von Ziemssen: "Ueber die physikalische Behandlung chronischer Magen- und Darmkrankheiten," p. 10, Leipzig, 1888.

[3] Max Einhorn: Medical Record, May 9th, 1891.

The rubber capsule serves to avoid the direct contact of the metal with the stomach wall; the circuit is completed by the water the stomach contains.

This electrode I have termed "Deglutable Stomach Electrode."[1]

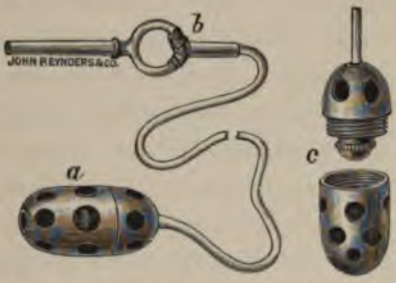

FIG. 37.—The Deglutable Stomach Electrode (Einhorn).

Method.—The patient drinks, best when in a fasting condition, or one to two hours after a light breakfast, one glassful of water, tea, or coffee. The patient has now to open his mouth widely, and the electrode (the capsule piece) is placed far behind on the root of the tongue and he is ordered to swallow. He again drinks some water, and the electrode finds its way to the stomach without any further assistance.

In order to recognize this point precisely, it is advisable to make some mark on the tubing at a distance of 40 cm. from the capsule; as soon as this mark comes to the teeth we are sure that the electrode is in the stomach and we can apply the electricity to the patient.

According to my belief, it is of importance to apply gastro-electrization according to a certain plan. Thus it will not appear superfluous to give a detailed description of the electric application I[1] generally employ.

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[1] The Deglutable Stomach Electrode is manufactured by John Reynders & Co., 303 Fourth Avenue, New York.

The patient, when the deglutable electrode is within the stomach, opens his clothes, so that the abdomen is accessible. The key of the deglutable electrode is connected with the cord (negative pole) running to the battery.

Gastrofaradization.—Sitting, ten minutes; at first large plate electrode at the gastric and epigastric region for five minutes, then a small ordinary sponge electrode. The electrode is at first moved up and down from left to right in the gastric region (sometimes, especially when there is constipation, the electrode is passed over the region of the colon—ascendens, transversum, descendens—always beginning in the right iliac region and stopping at the left iliac region [duration, two minutes]); thereafter one proceeds from the gastric region from right to left to the back, and remains at the left side of the seventh dorsal vertebra for one minute. (At this place the current can be applied quite strongly, and most of the patients then experience a slight sensation within the stomach; the patients find it difficult to describe this sensation; some assert that they experience a dragging feeling, others a feeling of weight, and others again of pinching. All of them refer this feeling to the stomach and locate it opposite different heights of the abdominal wall.) We then return to the front, moving the electrode gently up and down over the gastric region for two minutes, gradually decreasing the current, and thus ends the sitting. The current has to be of such a strength that it causes distinct contractions of the abdominal walls; but it is not well to have it so strong that the patient experiences pains.

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[1] Max Einhorn: "Therapeutic Results of Direct Electrization of the Stomach," Medical Record, January 30th and February 6th, 1892.—"Further Experiences with Direct Electrization of the Stomach," New York Medical Journal, July 8th, 1893.

Gastrogalvanization.—Negative pole within the stomach; small sponge electrode. Duration, eight minutes. First, two minutes below the ensiform process (during the first minute the current is gradually increased to its necessary strength), then for three minutes moving the electrode up and down the gastric region. After this, we then go to the back and remain one minute at the left side of the seventh dorsal vertebra, return to the front, move the electrode around the gastric region for one minute, and remain then quietly for one minute below the ensiform process. During this time the current is gradually weakened and the sitting is ended; the strength of the current is ordinarily fifteen to twenty milliampères.

In withdrawing the electrode a resistance is felt at the introitus œsophagi; it is not advisable to pull the electrode with force. One has only to make the patient swallow once or twice, and to make use of the moment when the larynx, by this act, ascends and the passage becomes free, to withdraw the electrode, which is done now with perfect ease. I ordinarily apply the electrization every other day during the beginning of treatment; afterward—*i.e.*, after the lapse of two to three weeks—twice weekly for about three weeks, and thereafter once a week for some time. As a rule, I begin to decrease the frequency of the sittings when I notice a decided improvement in the condition of the patient. Even after a complete disappearance of the symptoms it is advisable to continue the electrization (once a week) for some time.

Direct electrization of the stomach by means of the deglutable electrode is very simple and handy for the patient and for the physician, and, as it seems to me, as easy to apply as percutaneous electrization. After the first application the insertion of the electrode is much easier, the patient being accustomed to the procedure.

The principal advantage of the deglutable electrode consists, firstly, in that we are able to apply the method in persons not used to the stomach tube, and, secondly, in that the thin cord does not cause any uncomfortable feeling to the patient during the entire electric sitting and does not provoke salivation. Another advantage lies in the circumstance that the deglutable electrode can be swallowed even in those cases in which ulcer of the stomach is suspected, whereas the old stomach electrode could not be introduced in them for fear of causing perforation.

By means of the deglutable electrode a regular course of electric treatment of the stomach becomes possible in many cases and is facilitated in all.

I have made an extensive study of the physiological effects of direct electrization of the stomach and have published the results in several papers. From my experiments it follows conclusively:

1. Direct faradization of the stomach increases gastric secretion (*a*) during the application of electricity and also, (*b*) for a short period afterward.

2. Direct galvanization of the stomach with the

negative pole within the organ in most instances diminishes gastric secretion.

3. Direct faradization as well as galvanization of the stomach increases the absorbent faculty of the stomach.

As regards therapeusis I came to the following conclusions:

1. Direct gastro-electrization is a potent agent in the field of chronic (non-malignant) diseases of the stomach.

2. Direct gastrofaradization proves to be useful in many ways in most chronic diseases of the stomach. The favorable results appear very clearly and pretty quickly in those cases of stomach dilatation which are not caused by any obstruction of the pylorus, but merely by the relaxation of the muscular coat of the stomach. Here the gastrofaradization is beneficial, no matter whether in these cases there is hyperacidity or subacidity of the stomach contents. Cases of relaxation of the cardia (eructations), and also of relaxation of the pylorus (presence of bile secretion in the stomach), were very favorably influenced by faradization. Here the result was most markedly pronounced, inasmuch as, besides the subjective amelioration of the patient, the objective examination showed at the same time the absence of bile in the stomach contents.

3. Gastrogalvanization is almost a sovereign means for combating severe and most obstinate gastralgias, no matter whether their origin is of a nervous nature or caused by a cicatrized ulcer of the stomach.

4. Gastrogalvanization exerts also a favorable influence on several affections of the heart complicated with gastralgia.

With regard to the effects of the current in diseases of the stomach, it is very difficult to give a full theoretical explanation. I perfectly agree with Stockton,[1] who says:

"Exactly what rôle is played by faradization I am unable to state; whether it is a gastric sedative or a gastric stimulant I do not know. My efforts were in the direction of study, and the results were so favorable that I applied faradism to cases seemingly contradictory in character, and I have concluded that the great variety of gastric neuroses depend upon a common cause—an imperfect innervation of the stomach; that electricity improves this innervation, thereby relieving the cause and so the conditions which, at first thought, are so contradictory."

In therapeusis the chief factor in determining the efficacy of any means of treatment is and will be our empirical experience. For this reason I do not think it necessary to go into further details of the manner in which electric currents act upon the human organism. The very numerous successful results obtained by this method of treatment warrant its general use in practice.

Since the publication of my papers on direct electrization of the stomach many authors in this country as well as in France and Germany have made use of this method of treatment and highly recommend it. Thus

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[1] Charles G. Stockton: "Clinical Results of Gastric Faradization." American Journal of the Medical Sciences, 1890, p. 20.

Stockton, Ewald, Ravé,[1] A. A. Jones,[2] D. D. Stewart,[3] Rosenheim,[4] Brock,[5] Goldschmidt,[6] and others have published good results obtained by intragastric electrization. Ewald approves of the shape and form of my electrode, but finds it difficult to introduce it into the patient's stomach. For this reason he has modified my electrode by using a thicker rubber tubing around the wire: the tubing corresponds to No. 13 Charrière and is about 1½ mm. thick. I have not found, however, that the insertion into the stomach of the deglutable electrode offers any difficulties.

The principal point is to put the electrode far back into the pharynx and to let the patient meanwhile drink something. It is advisable to have the patient drink slowly about a glassful of water, and to have a talk with him, in order to distract his attention from the procedure. The electrode usually soon reaches the stomach, and it seldom happens that it remains lying in the fauces. If this does happen, the patient must eat a small piece of bread and drink some water; the electrode will then find its way into the stomach with the bread.

If in a very rare case the deglutable electrode cannot be introduced, there is yet always time to use instead the electrode as modified by Ewald.

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[1] J. Ravé: "Contribution à l'étude du traitement des dyspepsies par l'électricité," Paris, 1893.

[2] Allen A. Jones: Medical Record, June 13th, 1891.

[3] D. D. Stewart: Therap. Gazette, 1893, p. 744.

[4] Rosenheim: Berliner Klinik., May, 1894.

[5] Brock: Therap. Monatshefte, 1895, p. 275.

[6] Goldschmidt: "Ueber den Einfluss der Elektricität auf den gesunden und kranken menschlichen Magen." Deutsch. Arch. f. klin. Med., vol. xv., p. 295.

Wegele[1] has lately devised a new gastric electrode which he terms the spiral electrode. Inasmuch as this electrode has to be used through a stomach tube, it has no advantage whatever over the ordinary stomach electrodes formerly in use, as the principal progress achieved by means of the deglutable electrode is that the stomach tube can be dispensed with in the application of electricity.[2]

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[1] Wegele: Therap. Monatshefte, 1895, p. 195.

[2] Internal massage of the stomach has been recently suggested by Dr. Fenton B. Turck, of Chicago, Ill., by means of his "gyromele" or "revolving sound." This instrument consists of a flexible cable, to the end of which is attached a sponge covering a spiral spring, which can be removed from the cable at will and changed. The cable passes through a rubber tube, and this again is attached to a revolving apparatus, for the purpose of producing revolutions of the sponge. (See American Medico-Surgical Bulletin, July 1st, 1895.)

CHAPTER V.

ORGANIC DISEASES WITH CONSTANT LESIONS.

THE ACUTE AND CHRONIC GASTRIC CATARRH.

1. *Acute Gastritis.*

Synonyms.—Gastritis glandularis acuta; acute gastric catarrh; catarrhus ventriculi acutus.

Definition.—An inflammation of the gastric mucous membrane, resulting in disturbances of digestion.

Acute gastritis may be divided into the three following forms: Gastritis acuta simplex, gastritis-phlegmonosa, and gastritis toxica.

Gastritis Acuta Simplex or Acute Gastric Catarrh.

Etiology.—Acute gastric catarrh is one of the diseases most frequently met with in the practice of the physician, and occurs at all ages and among all classes of society. It is usually attributable to errors in diet, the chief cause being an abnormal quantity of ingesta. Irritation followed by inflammation of the stomach often results from the use of very hot, but especially ice-cold drinks, or from too highly spiced or fermented foods. If food be imperfectly masticated and swallowed in big lumps, it may mechanically disturb the stomach and lead to inflammation. The same effect is induced by many irritating substances, as, for instance, alcohol, rancid butter, etc.

The sensibility of the stomach is not always alike. One of the above-named causes may be productive of a catarrhal condition in one person, while in many others it remains perfectly inactive. The tendency to acute catarrh of the stomach varies very much in different individuals and families. Some people have a certain predisposition for this affection, which is designated by the expression "delicate stomach." The latter is often found in anæmic women, in old persons, and invalids of all kinds. The question whether the acute gastric catarrh may originate by way of infection has not as yet been settled. The epidemic appearance of this affection at a certain time speaks in favor of such an assumption, which was first propagated by Lebert[1] and Oser.[2] No micro-organisms, however, have been found within the stomach wall to corroborate this theory. Besides the above-named direct causes, acute gastric catarrh is indirectly engendered by all acute infectious diseases, which it ordinarily accompanies.

Morbid Anatomy.—As gastritis as such hardly ever causes death, and inasmuch as the stomach after death quickly undergoes radical changes which destroy the true picture that had before existed, the minute histology of the affected stomach can be studied only with the greatest difficulty. Even nowadays we have no better description of the macroscopical aspect of the inflamed organ than that given nearly seventy years ago by Beaumont[1] from his observations made on the well-known Canadian St. Martin with his gastric fistula. The mucous membrane appears entirely or partially swollen and reddened and is marked here and there with small sacculations. Less gastric juice is secreted, and mucus covers the surface. The pyloric portion, as a rule, is more affected, and there exist more or less extensive extravasations of blood. The secretion is only weakly acid or neutral, or even alkaline.

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[1] Lebert: "Die Krankheiten des Magens," Tübingen, 1878, p. 29.

[2] Oser: "Magenkrankheiten." Eulenburg's "Realencyclopædia," vol. xii., p. 410.

Microscopically the principal cells are found to be more granular and cloudy, partly fatty and shrunken. There is no distinction possible between the parietal and the principal cells. In the interglandular tissue numerous round cells are found. They are also met with between the epithelial cells and appear to be wandering to the surface. These round cells, according to Sachs,[2] give distinct pictures of karyokinesis.

Symptomatology.—Immediately after a manifest indiscretion of diet there is experienced, first of all, a feeling of heaviness at the pit of the stomach; later on a sensation of fulness. There is a desire to belch, and a difficulty in doing so. After belching, the patient feels easier for a little while, but soon the heavy sensation reappears. This condition may persist unchanged for a few days, and then gradually disappear. This is the mild form of the acute catarrh. Very often, however, we meet with more alarming symptoms. At the beginning there may exist nausea, a sensation of weight, and slight pains in the gastric region, severe headache, sometimes rise of temperature, later on vomiting, extreme anorexia, constipation, or diarrhœa. Soon the symptoms become less severe, and appear as described in the milder form.

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[1] Beaumont: *l. c.*

[2] A. Sachs: "Zur Kenntniss der Magenschleimhaut in krankhaften Zuständen." Arch. f. experim. Pathologie, Bd. 22, Heft 3, and Bd. 24, Heft 1 and 2.

Objectively the gastric region appears bloated, and is sensitive to pressure. The tongue is thickly furred, and the taste pappy. If vomiting occurs, the ejected matter contains no free hydrochloric acid, is of a slightly acid or neutral or alkaline reaction, and is frequently mixed with a great deal of mucus.

The duration of the affection is short, as a rule from one to three days. The more severe cases begin with a sudden rise of temperature (102° to 104° F.), which may be accompanied with chills. In such instances the gastric symptoms may at first be less marked than the symptoms caused by the fever. After a short period, however, the gastric symptoms become more pronounced.

The inflammatory process of the stomach not rarely extends into the intestines, and then causes constipation or diarrhœa. The affection may also invade the gall bladder, and then gives rise to icterus. In the febrile form of gastritis herpes labialis is of frequent occurrence.

Diagnosis.—It is easy to make the diagnosis in those cases which are not accompanied by fever, and where the cause of the trouble is apparent. The analysis of the gastric contents or of the vomited matter shows a marked diminution in the secretion of gastric juice. An acute gastritis accompanied by fever will at times cause some difficulty in diagnosis. As is well known, most of the infectious diseases are accompanied by gastric catarrh at their commencement, but they can be easily excluded by the absence of their pathognomonic symptoms. It is less easy to make a differential diagnosis between a beginning typhoid fever and acute gastric catarrh. In fact, the distinction between these two conditions is sometimes almost impossible during the first and second days of the sickness.

The following may serve as differential points of diagnosis between these two conditions:

In typhoid fever the temperature is characterized by its gradual rise, while in gastric catarrh the rise of temperature is quite sudden; we may have at the very start a temperature of 103° or 104°. The remission in gastric catarrh will likewise be more pronounced. The presence of herpes labialis will speak in favor of gastric catarrh, while the appearance of Ehrlich's diazo reaction in the urine will point to typhoid fever.

Biliary calculi not causing very severe pains, and not accompanied by icterus, may sometimes be mistaken for a gastric catarrh. Such an error in diagnosis will, however, occur but seldom; as a rule, it is [illegible] to [illegible]ntiate between these two conditions.

[illegible] The prognosis of gastric catarrh is very [illegible] in cases of very old people and in[illegible] the process may cause serious compli[illegible]

[illegible] The *vis medicatrix naturæ* is best seen [illegible] In order to become freed of the un[illegible] the stomach empties itself either by [illegible]erring its contents into the small [illegible] turn get rid of them by diarrhœal passages. The anorexia prevents the patient from taking food, and in this way the stomach can enjoy perfect rest and soon recuperate.

In our treatment we have to imitate or rather assist nature. If spontaneous vomiting does not take place, and a feeling of pressure and pains in the stomach are present, if percussion over the gastric region gives dulness, and belching of badly smelling gases occurs, then we may be certain that all the symptoms mentioned are caused by decomposed food within the organ. Here it is best to look for means which will remove this obnoxious material. Washing out of the stomach is the best way to accomplish this end. Instead of lavage, however, we may tell the patient to drink half a pint or even a pint of lukewarm water in which a small quantity of table salt has been dissolved, and then tickle the throat with the end of a quill or with the finger in order to produce vomiting. Camomile tea can also be taken in the same manner before bringing on vomiting.

Emetics are rarely given nowadays. In suitable cases it is best to make use of the subcutaneous injection of apomorphine (the dose being about one-half a centigram). Tartar emetic and ipecacuanha should never be employed except in children. The stomach after having been emptied should now enjoy perfect rest for some time. Thus during the first or second day of illness it is best not to give the patient anything substantial to eat. Strained barley or rice water or weak tea may be taken. On the third day, as soon as the appetite reappears, the patient is permitted to partake of a water soup (bread and hot water), of oatmeal or barley gruel, rice soup, and perhaps one soft-boiled egg. Later on French bread, butter, and oysters may be added to the dietary. If the improvement is steadily progressing, we begin on the fourth day with meat once a day, and thus slowly return to the usual bill of fare. As a rule, no medicines whatever are needed. If obstinate constipation exists, however, and the bowels have not moved during the first two days of sickness, some aperient may be given. A large dose of calomel (ten to fifteen grains) administered once is very serviceable. This remedy should especially be employed in the febrile form of gastritis. If there is no fever, Seidlitz powders or a good dose of citrate of magnesia will serve the purpose.

In rare instances in which the symptoms appear in a very aggravated form they may require special attention. A pronounced sensation of pressure and fulness in the gastric region after the ingestion of food may be relieved by small doses of dilute hydrochloric acid (ten drops in a glassful of water three times daily half an hour after meals).

A high degree of pyrosis can be relieved by the following medication:

℞ Calcined magnesia,
Sodium bicarbonate,
Peppermint sugar, ... āā 10.0
M. f. pulv. D. ad scatulam. S. A point of a knife every two hours.

Severe pains may be relieved by a small dose of codeine:

℞ Codein. phosph., ... 0.1
Aq. menth. pip., ... 40.0
S. One teaspoonful twice or three times daily.

Gastritis Phlegmonosa.

Synonyms.—Gastritis phlegmonosa purulenta; purulent inflammation of the stomach.

This affection usually runs an acute, and very rarely subacute course. The inflammatory process is situated in the submucous and muscular layers of the stomach, differing in this respect from acute gastritis, in which the glandular layer is affected. Phlegmonous gastritis is a very rare disease and occurs more frequently among men than women. Two forms of this affection are met with: the primary or idiopathic and the metastatic. Although the exact cause of primary purulent gastritis is as yet unknown, the symptoms and course of the morbid process justify the assumption that it is due to some micro-organism. The metastatic form occurs in pyæmic and puerperal fever or severe exanthemata.

Morbid Anatomy.—There may be present either a circumscribed abscess in the gastric wall (gastritis phlegmonosa circumscripta or abscess of the stomach), or a diffuse purulent infiltration. In the latter instance, numerous small abscesses of pea or hazelnut size are generally found. The mucosa over these areas appears swollen. The abscesses lie in the submucosa or muscularis and often extend to the serosa. If the purulent process progresses further, perforation may occur either into the stomach or into the abdominal cavity.

Symptomatology.—After the existence of dyspeptic symptoms for some time, or without any previous disturbances, the patient suddenly experiences an intense pain in his gastric region. At the same time there appear a violent burning sensation within the stomach, extreme thirst, dry tongue, and perfect anorexia. These symptoms are accompanied by high fever (103°–105° F.), with only very short intermissions. Sometimes the onset of the disease is attended by chills. The pulse is small and irregular. In most instances there is vomiting and retching, the vomited matter consisting mainly of mucus and some bile. The gastric region is very painful to pressure. The bowels are either constipated, or (as is generally the case) diarrhœal. The disease, as a rule, ends fatally in a very short time (four to seven days). It may, however, last fourteen days. The chronic form occurs most frequently in the course of the so-called gastric abscess.

Diagnosis.—An exact diagnosis of this affection can hardly be made during life. If, in connection with the above symptoms, there is an increased resistance in the gastric region with severe pain on pressure, we should think of purulent gastritis.

Treatment.—The treatment should be symptomatic. Ice-cold application to the abdomen, leeches, large doses of opium, or subcutaneous injections of morphine, and, if there is collapse, camphor, ether, and the like will have to be administered.

Gastritis Toxica.

Among the poisonous substances which directly affect the gastric mucous membrane, the following deserve special notice: Alcohol, phosphorus, arsenic, potassium cyanide, corrosive sublimate, nitrobenzol, potassium chlorate, concentrated mineral acids (sulphuric acid, nitric acid), and the caustic alkalies. The first-named substances cause an intense acute gastritis. The mucous membrane becomes swollen and superficially necrotic, leaving behind small hemorrhagic spots. Microscopically the glandular tubuli are found to have undergone fatty degeneration. The latter group of poisons (acids and alkalies) act quite differently. They directly destroy the parts they come in contact with and in this way the whole mucous layer may become destroyed; sometimes, should the poison penetrate still farther, the submucosa may also be destroyed, and rupture of the stomach takes place.

Symptomatology.—The symptoms will be more or less marked according to the quantity of poison taken. There is always pain in the gastric region, which is increased on pressure. Vomiting is of very frequent occurrence. The vomited matter may contain an admixture of blood. Thirst is always present. In cases of a severe nature there is always found a small pulse, cyanosis, cold perspiration, slight coma, and death may occur in collapse.

In other cases the course may be somewhat more protracted and either peritonitis or icterus, hæmaturia caused by the poison circulating in the blood, may develop. In those instances in which death does not occur there may arise—after the acute symptoms of poison have been subdued—a condition which is similar to that of a subacute gastritis.

It sometimes, though seldom, happens that the mucous membrane of the stomach is affected to such a high degree that it may entirely atrophy and then a condition of achylia gastrica will result. In cases of poisoning by mineral acids or caustic alkalies, it may occur that in consequence of the sloughing of an area situated either near the cardia or near the pylorus a stricture develops, thus causing serious complications. These strictures frequently develop later on, at a time when the patient perhaps imagines that he is entirely rid of his trouble. The stricture of the cardia causes dysphagia, and the stricture of the pylorus ischochymia.

Diagnosis.—The diagnosis is frequently made by the cross-examination of the patient, provided he is able to state what kind of poison he took. The inspection of the mouth, tongue, and pharynx may lead us to suspect poisoning by mineral acids or caustic alkalies, as both cause manifest lesions (sloughing) at these places when taken. The examination of the vomited matter will also frequently lead us to discover the nature of the poison.

Prognosis.—The prognosis will greatly depend upon the quantity of poison taken, and upon the condition in which we find the patient. On the whole, every case of poisoning must be considered as quite serious, recovery being doubtful.

Treatment.—In all cases of poisoning by concentrated mineral acids and caustic alkalies, the best mode of treatment is to effect dilution of the poison, and if possible its neutralization. Thus we give cal-
agnesia (100 gm. dissolved in a pint of
e patient as a drink in case the poison con-

sisted of a mineral acid; the magnesia will then neutralize the acid. On the other hand, we administer a drink consisting of lemonade or a weak solution of acetic acid (one to two per cent) in case the poisonous substance had been a caustic alkali, for the reason that the acid introduced forms a harmless combination with the poison. In the instances just mentioned, lavage cannot be used for fear of a perforation of the stomach; nor is it permitted to bring on vomiting, as the poisonous matters lodged within the stomach would cause a great deal of harm by their coming in contact with the œsophagus and mouth when ejected.

In all other kinds of poisoning (alkaloids and metals) it is always best to use lavage as early as possible, in order to free the stomach and the organism of that portion of the poison that has not yet entered the small intestines. Although an emetic (like apomorphine) can be used for this purpose, siphonage of the stomach is, however, by all means preferable, for only the latter permits a thorough emptying and cleaning of the organ. It is not the place here to speak of all the antidotes that have to be employed in these cases. The subsequent treatment will always depend upon the symptoms in each given case. In peritonitis ice will have to be applied on the abdomen, and opiates freely given. The treatment of a resulting stricture of the cardia or of the pylorus must, in most instances, be a surgical one. In the former cases, dilating of the cardia by means of bougies will first be tried.

2. *Chronic Gastric Catarrh—Gastritis Glandularis Chronica.*

Definition.—Chronic inflammation of the gastric mucous membrane, causing various disturbances in the act of digestion.

Pathological Anatomy.—The mucosa is usually covered with a thick layer of tenacious mucus presenting a yellowish-gray or slate-gray color, while some parts may appear intensely red. The latter condition is frequently found in the secondary catarrh caused by congestion. The mucosa is frequently thicker than normally, and forms papillary projections, thereby causing the so-called *état mamelonné.*

As a rule, the pyloric portion of the stomach is chiefly involved. The inflammatory process, however, may sometimes extend over the entire mucous membrane. In some instances the submucosa and muscularis may also undergo some changes, and appear either in a hypertrophied state or very much atrophied. Microscopically the glands often seem enlarged, sacculated, and dilated in cyst-like forms. The tubuli have lost their normal regular arrangement and show an atypical distinct ramification. The glandular cells appear granular and in a condition of fatty degeneration, and there is no longer any difference recognizable between the principal and parietal cells. An abundant small-celled infiltration is present which fills the interglandular spaces and pushes the glands apart. This small-celled infiltration is especially arked near the surface of the mucous membrane.

The superficial layer of the epithelium of the mucosa is frequently defective. The mouths of the glands are very often filled with a pale mucous mass, which projects against the lumen without any enclosing membrane. According to Ewald,[1] there is a condition of mucous catarrh in which the degeneration may be observed to extend down to the base of the glands, so that in place of the ordinary principal and parietal cells we find cells in the most varied stages of mucoid degeneration. This condition is especially found in the pyloric region. Some cells may be found which are still intact, the mucus filling only a small part of them, while the rest of the cell is occupied by granular protoplasm and a large nucleus. In others the mucus occupies the greater part of the cells and crowds the protoplasm and the flattened nucleus against its base; in still others the cell membrane has ruptured, and the mucus has escaped into the lumen of the duct of the gland. This mucoid degeneration Ewald found only in specimens which had been placed while still warm in alcohol. In older specimens the condition above described could not be discovered. In a patient with cancer of the pylorus, I had the opportunity to find in the wash-water a small piece of the gastric mucosa. It was placed in alcohol at once, and the microscope revealed a beautiful picture of mucoid degeneration (see Fig. 27).

The inflammatory process after existing for a long period may at the end lead to a total destruction of the glandular layer of the entire organ, thereby causing a condition which has been termed atrophy of the stomach or anadenia ventriculi (Ewald). Two different processes ultimately effect this condition.

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[1] Ewald: *l. c.*, p. 318.

The first consists in a fatty degeneration and destruction of the gland, the process progressing from the surface of the stomach inwardly. While in the early stage no glands are found on the surface of the mucosa, there still exist glandular cysts situated near the submucosa. Later on even these glandular cysts disappear, and the whole mucosa consists almost entirely of round cells. According to Ewald, this process is especially met with in those instances in which the entire organ is more or less dilated and the walls thin. The submucosa is then also partly changed, the muscular layer being much thinner.

The second process takes its origin in the submucosa, and progresses from the deeper layers to the surface of the stomach. In this instance the fibrous elements play the greater part. The inflammatory process causes the formation of fibrous tissue, which spreads around the glands and partly constricts them. The glands are also ultimately destroyed and their place taken up by fibrous tissue. As a rule this condition is found in stomachs which are much smaller than usual, and present a thickening of their walls. The size of the organ in such instances may be reduced to that of a big pear, and the walls may attain a thickness of about 1 to 2 cm. Brinton[1] has termed this condition "cirrhosis ventriculi," while the French designate it "sclerosis ventriculi." This condition of cirrhosis ventriculi, however, may be associated with the first-described process, as the following drawing of a case I have observed clearly illustrates.

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[1] W. Brinton: "Diseases of the Stomach."

Etiology.—Chronic gastric catarrh is more frequently met with among men than among women.

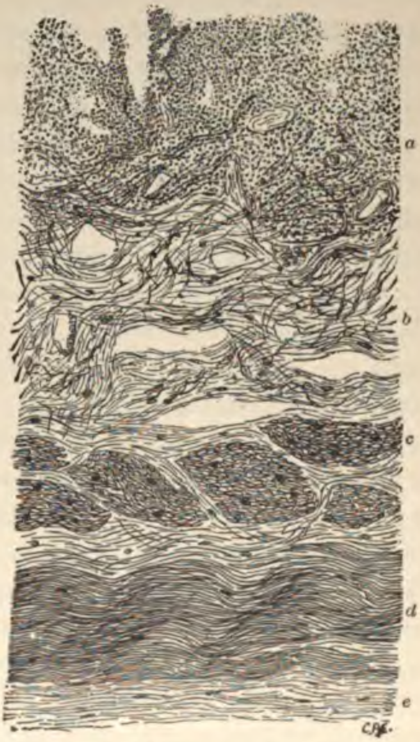

FIG. 38.—Cross-Section through the Stomach Wall (of A. G., with achylia gastrica), showing relations of the layers: *a*, mucosa; *b*, submucosa; *c*, *d*, muscularis; *e*, serosa. No glands in the mucosa. × 60.

It is often caused by an irrational mode of living. Fast eating, resulting in imperfect mastication of the food; overloading the stomach with too large quantities of food; highly spiced dishes; ice-cold drinks—all these tend to irritate the stomach, and to cause a catarrhal condition of the organ. In this country ice water and fast eating are the two principal causes of the so-called "American dyspepsia." Tea and coffee taken in too large quantities are also said to cause this trouble. Alcoholic drinks, especially the stronger ones, as whiskey or liquors (among them also stomach bitters), and the abuse of tobacco (smoking and chewing, especially the latter) also frequently give rise to this affection. But even in people leading a regular life chronic gastric catarrh may develop, either after frequently repeated attacks of the acute form or after the recovery from very severe infectious diseases. Thus typhoid fever is frequently found to be the origin of the affection. An unhealthy condition of the mouth, and more so of the teeth, is liable to produce gastritis, for in these instances the food on the one hand cannot be chewed thoroughly; on the other hand it becomes impregnated with products of decomposition originating from decayed teeth, and in this way produces an undue irritation of the gastric mucous membrane. Chronic gastric catarrh is moreover found as a secondary disorder in association with many other chronic diseases; thus, for instance, all kinds of pulmonary and cardiac affections, liver and kidney troubles, are frequently found to be complicated with chronic gastritis. Likewise some constitutional diseases, as for instance gout and diabetes, are frequently combined with gastritis.

Symptomatology.—As a rule the disease develops very slowly. The initial symptoms are not well marked. After the condition has lasted for a longer period of time the disturbances become more pronounced, and a train of many varied symptoms is present. The patients frequently complain of an abnormal taste in their mouths. They describe it either as salty or as pappy, in a few instances as sour. The appetite is ordinarily diminished, or, if present, the feeling of satiation appears after a few morsels of food. After meals there is a sensation of fulness in the gastric region, and the patient feels oppressed. This feeling, if present in a higher degree, sometimes gives rise to symptoms of quite an alarming nature. Thus the patients complain of palpitations of the heart and shortness of breath (asthma dyspepticum). In some instances again there appears a dizzy feeling, which is occasionally so severe that the patient cannot occupy a standing position but has to sit down or lie down. The oppression experienced is relieved by belching, but the latter may occur so frequently as to greatly annoy the patient. In fact, belching constitutes one of the most frequent symptoms of chronic gastric catarrh. As a rule, a quantity of odorless gas is brought up by the act of belching, although in very rare instances it may have an unpleasant odor.

Pain.—As a rule intense pains are absent. There is a mere sensation of discomfort and sensitiveness in the gastric region, which may increase after meals, more especially after ingestion of coarse food.

Pyrosis.—The patient may experience a burning sensation at the pit of the stomach. In this instance a sour liquid, alone or mixed with food, often comes up through the œsophagus into the mouth (regurgitation).

Vomiting.—Vomiting is not of very frequent occurrence in gastric catarrh. It is met with most frequently after the morning meal or in the morning on arising. In the latter instance the quantity ejected is quite small, and consists of a watery fluid containing principally mucus. A feeling of nausea is more frequently observed.

Condition of the Bowels.—The bowels are frequently found abnormal: either they are very constipated, which is quite the rule, or there may exist diarrhœa, or again periods of diarrhœa may alternate with periods of constipation.

Urine.—The urine is scanty, and frequently contains deposits of phosphates and urates.

General Symptoms.—The patients feel languid and manifest less energy in the performance of their work. Their mental activity is frequently weakened. They often complain of headache, especially in the morning, and a heavy feeling in the limbs. A desire to yawn is often met with, and some patients assert that they cannot breathe as deeply as they desire. In some instances the flow of saliva is greatly increased. Sometimes patients experience a constant irritating feeling in the throat, which they seek to relieve by a kind of hacking cough.

Objective Signs.—The general appearance of the patient is, as a rule, quite good. He looks well nourished, and usually possesses a good panniculus adiposus. Some patients, however, show black rings around their eyes, notwithstanding their being well nourished. Under these circumstances they frequently have cold hands and feet, and chill very easily. There are, however, exceptions to this rule, and patients are sometimes observed who have lost considerably in weight and appear quite emaciated and thin.

The *tongue* is, as a rule, covered with a fairly thick, grayish, and moist coating. The margins of the tongue show the indentations of the teeth. Either there is no offensive smell present in the mouth or, if it exists, it is due to some imperfection in the condition of the teeth, nose, or throat.

The *gastric region* often appears bloated. On palpation it is found to be sensitive to pressure, although there is no real pain. The splashing sound can be easily produced when the stomach contains some liquid. The size of the organ is, as a rule, not increased.

The *gastric contents:* One hour after Ewald's test breakfast the gastric contents show a lessened degree of acidity, and contain either no free hydrochloric acid at all or only small quantities. The pieces of roll are not as fine as normally. Pepsin and rennet are always present; erythrodextrin is present only in small quantities, while achroödextrin and sugar are abundant. The quantity of the gastric contents obtained after the test breakfast is either normal or somewhat larger (120–180 c.c.). Mucus may be present in great quantities in the gastric contents of some persons, while it may be absent in others. In the former case the gastritis is designated by the name of "gastritis chronica mucosa." The mucus in the gastric contents can be easily recognized by its appearance. A glass rod dipped into the contents and lifted in an oblique direction will cause a part of the mucus to be drawn up in the form of strings. The contents pass very slowly through filter paper, and the addition of acetic acid to the filtrate will produce turbidity. In the fasting condition the stomach is either found empty, or it may contain only a few cubic centimetres of a turbid liquid, consisting of mucus, and presenting either an alkaline, neutral, or acid reaction. In the latter instance free hydrochloric acid may be discovered in small quantities. Microscopically many round cells and some epithelial cells are found to be present. In washing out the stomach in the fasting condition, the wash-water, as a rule, contains more or less considerable quantities of mucus. Instead of examining the gastric contents, the vomited matter, if such is present, can be made use of for testing the chemical qualities of the gastric juice. As a rule, the same conditions will prevail here as stated above under the examination of the gastric contents.

The *motor function* of the stomach is either not impaired at all, or only slightly diminished.

Absorption.—Most writers assert that the absorption is retarded. It seems to me, however, that this rule does not apply to all substances. On examining the absorptive power in several cases of chronic gastric catarrh with the potassium iodide test, I could not see any marked departure from the normal.

I subjoin two cases of chronic gastric catarrh, one representing a mild and the other a more advanced form of this affection:

CASE I.—Mrs. L. W——, about 26 years of age, suffered for about four years from frequently recurring digestive disturbances (poor appetite, pains in the region of the stomach and in the abdomen). She had been treated by several competent physicians, sometimes with good results. Several months before consulting me the general health of the patient was impaired; the complaints, however, had greatly increased during the past six weeks. She suffered from pains in the region of the stomach, and could not eat sufficiently, for soon after partaking of the food she had a sensation of being laced; she could not sleep, and was troubled much with repeating and flatus; during the summer she lost in weight considerably.

Status præsens: Patient has a pale appearance and frail structure; color of lips and cheeks pale; tongue coated; chest organs normal; abdominal wall relaxed; the abdomen slightly distended; the epigastric region somewhat painful on pressure; the splashing sound can be produced below the left margin of the ribs down to a point three fingers' width above the navel.

One hour after the test breakfast: HCl = 0; lactic acid +; acidity = 60; erythrodextrin + much; mucus present.

When fasting, stomach is found empty; lavage brings up very little mucus.

Treatment: Nux vomica, HCl, gymnastics, cold washing and rubbing of the body, and direct gastro-faradization.

Soon after the beginning of this treatment the patient felt better; she could partake of more food; the pains first decreased in severity, and soon disappeared almost entirely. The patient gained during treatment (six to seven pounds) and acquired a healthy color.

CASE II.—Henry K——, 33 years of age, suffered for ten or fifteen years from "spitting of water." By this phrase the patient meant to express the belching every day, or at least every other day, of a considerable amount of a tasteless fluid from the stomach into the mouth, which he then expectorated. Sometimes this occurred ten or twelve times during the day. For the last eight or nine months the patient had this spitting after each meal. Appetite never good, although the patient could partake of each meal. When a boy he was strong and stout, but has been thin since his twentieth year. Sleep good; bowels moved every other day, but not regularly. During the last thirteen years there has been from time to time vomiting (*i.e.*, the ejection of the whole meal). Before the vomiting the patient has a sensation of oppression.

The physical examination of the chest organs reveals nothing abnormal. The stomach reaches down to within two fingers' width of the symphysis, as shown by gastrodiaphany and splashing sounds.

One hour after the test breakfast: HCl = 0; acidity = 14; rennet ferment +. (Similar results have been obtained by examination on several other occasions.)

Course.—The duration of chronic gastritis is a very long one.

Very frequently there are exacerbations of the symptoms, even when the condition was apparently almost entirely subdued. Indiscretions in diet are especially liable to cause a recurrence. Often, however, a rational treatment effects the disappearance of all the symptoms, and the condition of perfect euphoria may last for years and years.

Diagnosis.—In the diagnosis of chronic gastritis the following points demand attention:

1. The long and progressive course of the disease.
2. The symptoms above described.
3. The decreased secretion of gastric juice (low

acidity), which in some may be combined with an undue amount of mucus.

Differential Diagnosis.—It is quite easy to distinguish between primary and secondary chronic gastritis. The latter accompanies many organic diseases of vital organs. The recognition of the principal ailment shows the true nature of the affection. It is more difficult to differentiate between chronic gastric catarrh and other lesions of the stomach: ulcer, cancer, neurosis, achylia gastrica. Chronic gastritis is never accompanied by very severe pains, and thus presents a contrast to ulcer and cancer. Absence of a circumscribed spot painful to pressure in the gastric region also speaks against ulcer. There is no hæmatemesis, and as a rule no marked emaciation in chronic gastritis, while in ulcer and cancer these two conditions are frequently met with. It is quite difficult to differentiate between chronic gastritis and gastric neuroses of a depressing nature. The symptoms may be alike in both, especially the diminished gastric secretion. These neuroses may sometimes be recognized by the discovery of other nervous symptoms. Sudden changes in the chemical condition of the gastric contents speak in favor of the existence of a neurosis. Changes in the subjective symptoms, their entire disappearance for a few days, and then their sudden reappearance, either in the same form as before or in a changed manner, are also characteristic of a gastric neurosis. Chronic gastritis, on the other hand, shows, as a rule, more or less consistency in the conditions of the gastric juice as well as of the other symptoms. While changes in the subjective sensations of the patient may occur, they are, however, less abrupt and less pronounced than in the neurosis. Achylia gastrica is recognized by the total disappearance of gastric juice, *i.e.*, by the absence of hydrochloric acid and both ferments, rennet and pepsin. Although chronic gastritis may terminate in such a condition (a disappearance of juice), it is nevertheless more practical to separate achylia gastrica from gastric catarrh, as there are several other conditions which lead to this affection, and as it requires a different treatment.

Prognosis.—The prognosis of a genuine chronic gastritis is not bad. A rational treatment succeeds, as a rule, in either curing or materially improving the patient. The ailment is, however, by no means of an indifferent nature; in a certain measure we can say that the trouble is the more serious the less secretion there is in the stomach. Very frequently we are not able to bring back the stomach to its normal state of secretion, even if we succeed in combating the subjective symptoms. Exacerbations and relapses are also liable to occur. For these reasons chronic gastritis must be considered as a tedious affection.

Treatment.—The regulation of the diet is of prime importance in the treatment. The dietary to be selected will depend upon the severity of the symptoms. At the beginning, therefore, a light diet will be called for. The patient should partake of four or five meals daily. The articles of food should be given largely in liquid and semi-liquid form; viz., milk, kumyss, matzoon, barley, oatmeal, and rice soups prepared in milk; chicken soup, with an egg beaten up in it; soft-boiled eggs; mashed potatoes; scraped meat, raw or broiled; toasted bread, and also French white bread (not too fresh); butter; tea and cacao. The quantity of nourishment for each meal should neither be excessively large nor too small.

Ewald's bill of fare for chronic gastric catarrh is as follows:

Eight o'clock—150–200 gm. of tea with 75–100 gm. of stale white bread, toast or zwieback.

Ten o'clock—50 gm. of white bread, 10 gm. of butter, 50 gm. of cold meat or ham, occasionally one glass of light wine or one-third litre of milk.

Two o'clock—150–200 gm. of water, milk, or bouillon of the white meats, 100–125 gm. of meat or fish, 80–100 gm. of vegetables, 80 gm. compot.

Four or five o'clock—one-fourth to one-third litre of warm milk (occasionally mixed with cacao or coffee).

Seven to eight o'clock—200 gm. of soup or pap, 50 gm. of white bread, 10 gm. of butter.

Occasionally at ten o'clock—50 gm. wheaten bread (biscuits or zwieback), one cup of tea.

My own bill of fare for the first week of treatment is as follows:

Eight o'clock:	Calories.
Two eggs,	160
Two ounces of French white bread,	156
One-half ounce of butter,	107
One cup of tea (100 gm. of tea, 150 gm. of milk),	101
Sugar 10 gm. (ʒ iiss.),	40
Half-past ten o'clock:	
Kumyss or matzoon or milk, 250 gm. (℥ viii. ⅓),	168
Crackers, 30 gm. (one ounce),	107
Butter, 20 gm. (ʒ v.),	163

	Calories.
Half-past twelve o'clock:	
Two ounces of tenderloin steak or the white meat of chicken,	72
Mashed potatoes, or thick rice, 100 gm. (℥ iii. ⅓),	127
White bread, two ounces,	153
Butter, one-half ounce,	107
One cup of cacao, 200 gm. (℥ vi. ⅔),	101
Half-past three o'clock:	
The same as half-past ten,	438
Half-past six o'clock:	
Farina, hominy, or rice boiled in milk, one plateful, 250 gm. (℥ viii. ⅓),	440
Two scrambled eggs,	160
Bread, two ounces,	156
Butter, one-half ounce,	107
	2,863

The patient having been kept on this diet for a week or two, the diet must be gradually changed to one suitable for the lighter forms of chronic gastritis. Here the following rule will apply: The diet should correspond as nearly as possible to the common mode of living. In this way the distribution of the meals should be arranged according to the customs prevailing in those places in which the patients live. All foods derived from the vegetable kingdom should be given in large portions, while the quantity of meat should be somewhat limited. In order to permit the patient to have a greater variety in his food, it is best not to point out a few articles he should eat, but to mention only those he should avoid. Forbid meat with very tough fibres, meat from too old animals or o fresh meat (right after slaughtering), meat that ains too much fat, like pork; forbid sausages, lobster, salmon, chicken salad, mayonnaise, cucumbers, pickles, cabbage, strong alcoholic drinks like liquors. It must be impressed upon the patient to masticate the food thoroughly, to eat slowly, not to think of business during meals, and to stop eating before the sensation of satiety appears. The latter advice is only necessary in persons who are accustomed to high living.

Hygienic Regimen.—Besides the diet it is of importance that the patient should lead a rational hygienic life. The business hours should not be too long, and plenty of exercise should be advised. Walking, driving, horseback and bicycle riding, rowing, are all to be highly recommended. It is, however, necessary to tell the patients not to overexert themselves. Gymnastic exercises at home, especially with an exercising machine, are also in place. I usually tell the patient to exercise in the morning for about ten minutes. A cold sponge bath on arising, and a thorough rubbing of the skin with a thick rough towel, are valuable. It is furthermore of importance to see that the patients live in well-ventilated rooms. A prolonged stay in places where there is much smoke (restaurants) should be prohibited.

In many instances, the regulation of diet and hygiene will be sufficient to improve the patient's condition. The direct means, however, of accomplishing this purpose comprise the four following:

1. Lavage; 2. Electricity; 3. Mineral springs; 4. Medicaments.

1. *Lavage.*—In most cases of chronic gastric catarrh washing out of the stomach will prove beneficial. The

mucous form of gastritis is especially benefited by this means. The lavage should be performed in the morning in the fasting condition of the patient. Pure, lukewarm water should be used in this procedure. Occasionally a small quantity of common table salt may be added. The lavage should be employed every other day for a period of two or three weeks. It is not advisable to entrust this procedure to the patient, as he is apt to overdo it.

2. *Electricity.*—In order to stimulate the stomach, the faradic current has frequently been made use of. While at first the percutaneous method of electrifying the stomach was used, lately the direct or intragastric mode of electrization has been more often employed. For percutaneous electrization a very large sponge electrode (18 by 12 cm.) is put over the abdomen, covering the entire gastric region, while the other, smaller electrode (diameter about 5 cm.) is held to the left of the seventh dorsal vertebra.

Intragastric electrization is by far more effectual and therefore preferable to the percutaneous method. Here the current reaches the inside of the stomach in undiminished strength, while in the percutaneous mode of electrization the greater part of the current is distributed over the skin and muscles of the abdominal cavity, and, if any, only a small fraction of the current reaches the gastric mucosa. The method of intragastric electrization has been described above (page 144). In chronic gastritis the faradic current should be employed. By means of intragastric faradization all the subjective symptoms frequently disappear, and if the electric treatment is administered over a period covering from two to three months there is often a lasting amelioration in the condition of the patient. The cases most suitable for this mode of treatment are those forms of chronic gastric catarrh in which not much mucus appears in the stomach.

3. *Mineral Springs.*—There are many mineral springs, the waters of which have a decided beneficial influence upon the chronic gastric catarrh. Many patients going to these watering-places and drinking the waters at the springs either become improved or are entirely cured. While these waters may be taken with some benefit at home, still a sojourn at a watering-place combines many other curative factors besides the water: the perfect rest and absence of all cares, and the fresh and invigorating country air.

The mineral springs which are most useful in this affection are the following:

1. Saline springs containing sodium chloride, and small or large amounts of carbonic acid gas: Wiesbaden (Kochbrunnen—temperature, 69° C.; sodium chloride, 0.68 per cent), Kissingen (Racoczi and Pandur—temperature, 10.7° C.; sodium chloride, 0.55 per cent), Homburg (Elisabethbrunnen — temperature, 10.6° C.; sodium chloride, 0.98 per cent), Soden (numerous sodium chloride [0.24–1.4 per cent] springs containing carbonic acid gas, of different temperatures [15°–30° C.]), Saratoga (Congress Spring).

2. Alkaline saline springs, containing sulphate of sodium, carbonate of sodium, sodium chloride, and carbonic acid gas in large amounts: Carlsbad (there are twelve springs, each possessing about the same quantity of salts: Sulphate of sodium, 0.23 per cent;

bicarbonate of sodium, 0.2 per cent; sodium chloride, 0.1 per cent; carbonic acid gas), Marienbad (Kreuzbrunnen and Ferdinandsbrunnen, 0.5 per cent sulphate of sodium), Saratoga (Hawthorne Spring).

In most instances the first group of springs (saline) are to be recommended. The second group of springs (alkaline saline) are to be employed in patients in whom constipation forms a very marked symptom. The use of these springs should, however, not be extended over too long a period of time. Patients of a nervous character should not partake of these purgative waters. Both the saline and alkaline saline waters can be taken at home, if the patient is not able to go to the springs. It is best to have the patient drink about a tumblerful of either of the waters early in the morning when arising, about an hour before breakfast.

4. *Medicaments.*—The medicaments were used to a much greater extent in the treatment of chronic gastric catarrh in olden times than nowadays. At present we have learned to pay more attention to diet, to hygiene, and to the mechanical means of treating the stomach. In some instances, however, the medicaments are also serviceable. Among these, hydrochloric acid is one that is most frequently employed in this affection. The idea of supplementing the deficiency of gastric juice by this acid, which forms its principal element, is quite natural. Leube[1] first introduced this medicament into the therapeusis of chronic gastritis and Ewald[2] likewise recommends it

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[1] Leube: "Die Krankheiten des Magens und Darms." Ziemssen's "Handbuch der spec. Patholog. und Therapie," Bd. vii., Heft 2, p. 75.

[2] Ewald: *l. c.*, p. 342.

very highly. He says: "In all cases where a diminution or absence of hydrochloric acid has been determined, *i.e.*, in all cases of chronic gastritis, it is therefore to be given preferably as the dilute hydrochloric acid of the pharmacopœia in large quantities, and certainly in larger doses than have thus far been recommended." The best way to administer this medicament is to give it in the form of drops, six to twelve of the dilute hydrochloric acid in a glassful of water, to be taken three times a day half an hour after meals, not drinking the whole glassful of water at once, but one-third at a time at intervals of one-quarter of an hour or half an hour. Ewald advocates larger doses than these, namely, forty to sixty drops of the dilute hydrochloric acid three times daily.

Pepsin used to be, and is yet very frequently given in combination with hydrochloric acid, the dose being about half a gram three times daily. Most writers, however, concur in the absolute inefficacy of this drug, and for two reasons, viz., (1) in most instances even of diminished gastric secretion (diminished acidity) there is yet an abundant quantity of pepsin present; (2) most pepsins that are in the market do not by any means show as strong digestive properties as the true pepsin of the stomach.

Formerly I was in the habit of employing hydrochloric acid either alone or in combination with pepsin quite frequently. Of late years, however, I have entirely abandoned the use of pepsin, and greatly restricted the administration of hydrochloric acid. The reason for this is based upon the belief that the means which serve for the digestion and utilization of food by the organism are certainly not limited to the stomach, but that the principal part of this process takes place in the intestines. The artificial means of aiding digestion are certainly not necessary, the more so since if employed for long periods of time they frequently become injurious to a certain extent. Every organ is strengthened by activity and weakened by the lack of exercise. Predigested foods, or medicaments which contain the active principles of the gastric juice and serve to replace the work done by the stomach, will, in the course of time, have a deteriorating effect upon the gastric functions. The stomach will grow weaker and weaker the more artificial gastric juice is poured into it, and the finer and more subtle the nourishments that are allotted to it. While I do not advocate the frequent use of hydrochloric acid and pepsin, I am strongly in favor of the administration of the so-called bitter medicaments (amara), condurango, quassia, gentian, kino, calumba, and nux vomica, which must be considered as effective stimulants of the gastric functions. Although the physiological efficacy of these drugs has been disputed by several writers (Tschelzoff and Jaworski),[1] empirical experience, however, speaks highly in their favor, and their use should certainly not be neglected. There is no doubt that condurango, quassia, and nux vomica increase the appetite, and in this way make the stomach fit to receive more food and thus raise the nutrition of the organism. I usually give fluid extract of quassia, calumba, or condurango in doses of twenty drops three times daily, or tincture of nux vomica, either alone in doses of ten drops three times daily, or in combination with the above drugs. All these medicaments must be taken about a quarter of an hour before meals in about a tablespoonful of water or wine. Creosote I frequently give in the gastritis of phthisical patients.

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[1] Jaworski: "Experimenteller Beitrag zur Wirkung und therapeutischen Anwendung der Amara und der Galle." Zeitschr. f. Therapie. 1886. No. 23.

℞ Creosote, ...	5.0
Compound tincture of gentian, ...	10.0

S. Eight drops in half a glassful of milk three times daily, half an hour after meals.

Orexin may also be given for the same purpose:

℞ Orexin. basic., ... 0.2 (gr. iiiss.)
D. in wafers t. d., No. 15. Sig. One wafer in a cup of bouillon half an hour before meals twice daily.

Chronic gastric catarrh is frequently combined with constipation, and it will be necessary to speak about the management of this complication. As a rule, I would say that the less medicaments used to combat this affection the better. The means available for this trouble are: You must tell the patient to go to the water-closet in the morning at a certain hour, to avoid much straining, and not to bother about the bowels any more during the whole day, even if there were no movement, and not to go to the water-closet unless there be a strong inclination for it until the following morning. Frequently this alone is sufficient to secure regularity of the bowels after a while.

The diet can also be arranged in such a manner as to facilitate movements of the bowels. All foods which contain a large percentage of cellulose (undigested matter) increase the quantity of fæces, and thereby effect a stronger peristalsis of the large bowels. All kinds of green vegetables (spinach, asparagus, green peas) and rye bread are therefore very suitable. Many organic acids possess the property of increasing intestinal peristalsis. Almost all kinds of fruits contain a certain quantity of these organic acids, and act like mild aperients. The use of cooked pears, stewed or baked apples, stewed prunes, is in many instances effective. Ewald recommends a mixture of two parts of prunes to one part of dried figs. The taste is agreeable and the cathartic action mild. The custom of eating an orange in the morning for its laxative effect is well known. To these dietary remedies we may also add the use of a glassful of either very cold or warm water, or of a glass of milk on arising, in the fasting condition. There are many persons in whom one of these latter means produces a good movement of the bowels.

In cases where the above dietary remedies do not suffice, the administration of a mild cathartic is not out of place. Rhubarb and cascara sagrada are chiefly in use. The former is given either in substance or in the form of a tincture, fifteen to thirty drops; the latter in the form of the fluid extract, fifteen to twenty-five drops twice daily. Aloes and podophyllin should be used only in the severer forms of constipation. I frequently give the following pills:

℞ Podophyllin, ... 0.3 (gr. v.)
Extract of nux vomica,
Extract of Calabar bean, . . . āā 0.5 (gr. viij.)

M. f. cum extr. gentian. et pulv. liq. q. s. pil. No. 30. S. One pill twice a day.

so-called Hamburg tea is also very efficacious.

All of these remedies should not be used for too long a time, and the patients should always accustom themselves to get along with fewer of these remedies, and ultimately without them. In cases in which there is atony (weakness) of the large intestine, the use of enemata is indicated. One quart of lukewarm water with a teaspoonful of salt is injected into the rectum by means of a fountain syringe provided with a soft-rubber tube. These injections should be made once a day, always at the same hour, and continued for about two weeks. The use of glycerin suppositories, or of a small quantity of glycerin in water (one teaspoonful to four or five tablespoonfuls of water) injected into the rectum, will be required only occasionally.

CHAPTER VI.

ORGANIC DISEASES WITH CONSTANT LESIONS.—*Continued.*

Ulcer of the Stomach.

Synonyms.—Ulcus pepticum seu rodens; ulcus ventriculi rotundum; ulcus simplex; ulcus ventriculi chronicum perforans.

Definition.—Gastric ulcer is a disease characterized by a more or less deep destruction of the mucous membrane of the stomach, exhibiting no tendency to healing, and attended with symptoms of pain, vomiting, and hemorrhage. Cruveilhier[1] in 1829 was the first to describe this affection.

Etiology.—The etiology of ulcer of the stomach has not yet been definitely elucidated. Age and sex seem to play a prominent part in its development. It is of quite frequent occurrence. According to Brinton[2] ulcer of the stomach is found (either open or cicatrized) in about five per cent. of persons dying from all causes. He further states that ulcer is more frequent in the female than in the male sex, the proportion being nearly as two to one. As regards age, the liability of an individual to become the subject of gastric ulcer gradually rises from what is nearly zero at the age of ten to a high rate, which it maintains through the period of middle life at the end of which it again ascends to reach its maximum at the extreme age of ninety. Ulcer of the stomach is especially, though not exclusively, a disease of middle and advanced life. According to Ewald,[1] ulcer of the stomach occurs most frequently between the twentieth and fortieth years, while its mortality is highest between the ages of forty and sixty.

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[1] Cruveilhier: "Anatomie pathologique," 1829–1835, Livraison x.

[2] W. Brinton: *l. c.*

The frequency of ulcer of the stomach seems to vary in different localities. Thus Berthold[2] gives the percentage of ulcer of the stomach for Berlin as 2.7 per cent.; Nolte for Munich as 1.23; Gries for Kiel as 8.3; Stark for Copenhagen as 13. Von Sohlern[3] has lately called attention to the fact that the Roen Mountains and the Bavarian Alps (Germany) and the greater part of Russia are nearly exempt from gastric ulcer. He further stated that the inhabitants of these territories exist almost exclusively on a vegetable diet. As such a diet is very rich in potassium salts (containing nearly one-third more of this salt than a mixed diet), and as the red blood cells are to be regarded as the chief carriers of potassium, von Sohlern claims that this increased amount of potassium represents the cause of the relative immunity of the above-mentioned inhabitants from ulcer of the stomach. On the basis of this theory, von Sohlern recommends the administration of potassium salts and of foods rich in vegetable matter as a prophylactic measure against ulcer. His theory, however, lacks the support of examination of the blood which alone could prove the correctness of the above statement.

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[1] C. A. Ewald: *l. c.*, p. 234.

[2] Cited from Ewald: "Diseases of the Stomach," p. 233.

[3] Von Sohlern: "Der Einfluss der Ernährung auf die Entstehung des Magengeschwürs." Berl. klin. Wochenschr., 1889, No. 14.

It has been furthermore asserted, especially by the English writers, that the frequency of gastric ulcer is greatly dependent on the various callings of life. Thus every one is familiar with the belief that cooks are especially subject to this malady. Shoemakers, porcelain makers, etc., are also mentioned as frequent sufferers from ulcer. These statements, however, are not based on correct data. Ewald, for instance, is of the opinion that even in cooks gastric ulcer is not more common than in other people.

Numerous writers have endeavored to study the etiology of ulcer by the way of experiments on animals. They have produced lesions of the gastric mucosa by cutting out a piece of the inner layer or by subjecting it to different caustic chemicals, but the investigations of Griffini and Vassale[1] showed that the mucous membrane of the stomach of such animals quickly replaces the defect experimentally produced and that after a short while the lesion is entirely healed. Thus these acute defects of the mucous membrane cannot properly be called ulcers, for they show no tendency to spread.

From these experiments it has been concluded that in the production of the gastric ulcer there must be not only a lesion of the mucosa, but also some anomaly in the condition of the blood. Quincke and Daettvyler[2] made animals anæmic by venesection and produced lesions in the gastric mucosa. In these instances the defect did not heal and a condition similar to a real ulcer was established. In some of the animals even perforation of the ulcer took place. Koch and Ewald[1] produced gastric hemorrhages in animals by section of the spinal cord. By introducing one-half-per-cent solution of hydrochloric acid into their stomachs deep ulcers arose. Silbermann[2] introduced substances into the circulation which disintegrated the blood corpuscles and produced hæmoglobinæmia. Here also the artificial defect of the gastric mucosa healed very tardily, and presented a similar aspect to a real ulcer.

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[1] Griffini und Vassale: "Beiträge zur patholog. Anat." von Ziegler und Nauwerck, Bd. 3, Heft 5, p. 425.

[2] Quincke und Daettvyler: Correspondenzbl. f. Schweizer Aerzte, 1875, p. 101.

There is no doubt that the above experiences gained by experiments on animals apply also to the human being. Acute lesions of the gastric mucosa in man very frequently occur and heal very rapidly without any ill effects. Clinically we know of cases in which a trauma in the gastric region produced hemorrhage by causing a tear in the gastric mucosa. In a few days, however, the patients recovered without presenting any gastric symptoms whatever at a subsequent period. Old English literature contains several reports of cases in which persons had swallowed knives which had passed the whole digestive tract without presenting any palpable symptoms. One of the most striking instances is that reported by Dr. Marcet[3] and mentioned by Ewald. "In the year 1799 an American sailor saw a juggler in Havre perform the trick of knife swallowing. Returning to his vessel somewhat intoxicated he was foolhardy enough to try to swallow his open pocket knife, and succeeding in this, he ate three more. Three passed off in the stool during the next few days, but one disappeared forever. One evening, six years later, he again swallowed portions of six knives, but this time not without unpleasant though very transient results, on account of which he was admitted to an hospital. He did this frequently till he had swallowed about thirty-five knives. Finally he was taken seriously ill and he died in Guy's Hospital in London in 1809. In the stomach some thirty pieces of blades, in parts markedly corroded, together with handles, were found; two blades in the colon and rectum which were placed transversely and had perforated the intestinal wall (and that without causing peritonitis !), but no recent or old ulcers of the stomach or any remains of them." In this as in other instances undoubtedly the gastric wall had suffered considerable injury but quickly regained its normal state.

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[1] C. A. Ewald: "Klinik der Verdauungskrankheiten," 1. Theil, 3. Aufl., p. 122.

[2] Silbermann: Deutsche med. Wochenschr., 1886, No. 29.

[3] Marcet: Medico-Chirurgical Transactions, vol. xii., p. 72.

A similar instance of a grave lesion of the gastric mucosa without any ill effects I had the opportunity to witness myself, and it might be worth while briefly to describe it.

A boy of eleven years, suffering from epilepsy, during one of his attacks fell from a window on the first floor of the house into the yard, striking the stone pavement with his abdomen. He was found unconscious and brought up into his room, where he remained in this condition for about an hour. Upon thorough examination no traumatic lesions of the skull could be discovered; his nose did not bleed, nor was any blood found in his mouth. About two hours after his fall he suddenly vomited over a pint of fresh blood partly mixed with food. Six hours afterward about the same quantity of blood was again brought up. On palpation there was no pain in the gastric region. The boy was kept quiet for a few days and quickly recovered. Even during his stay in bed he never complained of pain. Afterward he could eat everything and remained entirely free from any gastric symptoms.

Analogous to the above experiments on animals which had been rendered anæmic, we also find gastric ulcer quite frequently in chlorotic individuals, and it may be readily imagined that many lesions of the gastric mucosa which would otherwise remain without ill effects are prevented from healing by the depreciated condition of the blood and become converted into ulcers. It is, however, impossible to say that this theory would apply to all cases of ulcer of the stomach, for very often we find this affection in people who are a picture of health, and whose blood condition is apparently without any anomalies.

Other Theories as to the Origin of Gastric Ulcer.—As is well known, erosions of the gastric mucosa are found in chronic gastritis and in other diseases complicated with disturbances of circulation. The origin of erosions is explained by Harttung[1] in the following way: The contraction of the muscularis of the stomach produces an arrest of the circulation in the rugæ with intense congestion in the veins and capillaries, which in turn gives rise to hemorrhages into the mucous membrane. Hemorrhagic infiltration of the mucous membrane arises, in consequence of which the latter receives little or no fresh circulating blood, and very soon succumbs to the digestive effects of the gastric juice. In this way the decay and the destruction of the tissue and the hemorrhagic erosion are produced. These erosions are superficial defects of the gastric mucosa, extending as a rule not deeper than half its thickness. Rokitansky,[1] and subsequently Rindfleisch[2] and Key,[3] established the theory that the ulcer arises from the further development of an erosion (hemorrhagic erosion).

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[1] O. Harttung: "Ueber Fatenblutungen und hämorrhagische Erosionen." Deutsche med. Wochenschr., 1890, No. 38, p. 847.

The view, however, that there is a difference in degree but not in type between erosion and ulcer of the stomach is not correct. Langerhans[4] based his opposition to this theory on his experience gained in autopsies. I[5] have shown that the diagnosis "erosions of the stomach" can be made clinically, and stated that in none of the cases observed by me an ulcer developed. Virchow[6] first expounded the view that the ulcerative process may result from plugging up of the nutrient artery of a certain part of the mucosa either by an embolus or by a thrombus, and that the infarct thus produced is destroyed by the gastric juice. In this way a circumscribed defect arises. Although this view has been greatly supported by Panum's[7] experiments, who succeeded in producing emboli in the gastric arteries and ulcers in consequence thereof, it is, however, still undecided whether this etiological factor comes into play in all cases of gastric ulcer; for very often the evidence of an embolized or thrombosed artery in the neighborhood of the ulcer is missing. Instead of the older theory that the diminished alkalinity of the blood is the cause of the ulcer (Pavy[1]), the newer one has been generally accepted: that the hyperacid gastric juice is the most important etiological factor in the production of ulcer. Although this theory had already been expressed by Wilson Fox[2] and other of the older writers, the credit of having placed it on a firmer basis belongs to the more recent investigators, Riegel,[3] Jaworski and Korczynski,[4] Ewald[5] and Charles G. Stockton.[6] It has been found by these authors that hyperacidity of the gastric juice is, if not of constant, at any rate of very frequent occurrence in gastric ulcer. Furthermore, it was ascertained that those conditions in which gastric ulcer is very frequently found (as, for instance, chlorosis, anæmia, amenorrhœa) are also associated with an hyperacid gastric juice. From my own experience I would certainly say that hyperacidity is very often met with in gastric ulcer. There are, however, exceptions to this rule, and twice I had the opportunity of observing gastric ulcer in cases in which there was an entire absence of gastric juice (achylia gastrica). One of these cases did not present any symptoms indicative of an ulcer, the latter had been found accidentally in performing an exploratory laparotomy on the patient. This case is as follows:

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[1] Rokitansky: "Lehrbuch der patholog. Anatomie."

[2] Rindfleisch: "Lehrbuch der patholog. Anatomie."

[3] Axel Key: Gurlt-Virchow's Jahresb., 1871.

[4] Langerhans: Virchow's Arch., Bd. 124, p. 373.

[5] Max Einhorn: Medical Record, June 23d, 1894.

[6] R. Virchow: Virchow's Archiv, Bd. v., p. 363.

[7] Panum: "Experimentelle Beiträge zur Lehre von der Embolie." Virchow's Archiv, Bd. 25, 1862.

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[1] Pavy: "On Gastric Erosion." Guy's Hospital Reports, vol. xiv., 1868.

[2] Wilson Fox: "The Diseases of the Stomach," 1872, p. 146.

[3] F. Riegel: Zeitschr. f. klin. Med., Bd. xii., p. 434, and Deutsche med. Wochenschr., 1886, No. 52.

[4] Jaworski und Korczynski: Deutsche med. Wochenschr., 1886, Nos. 47–49.

[5] C. A. Ewald: *l. c.*, p. 229.

[6] Charles G. Stockton: "The Etiology of Gastric Ulcer." The Medical News, January 14th, 1893.

G. M——, 56 years old, has been complaining for the last three years of attacks of dizziness, extreme anorexia, and occasional vomiting. For weeks after such an attack patient could not walk well on account of a giddy feeling which he often experienced. Bowels were rather constipated. The physical examination of the patient did not reveal anything abnormal, except an anæmic state which found expression in a pale color of the mucous membrane of the lips, eyelids, and the palate. A splashing sound could be easily produced in the gastric region down to the navel. The urine did not contain sugar or albumin. The gastric contents were frequently examined in the course of a whole year with always about the same result: $HCl = 0$, acidity between 2 and 4, no rennet, no pepsin, no biuret test. Patient improved on a richly vegetable diet and gained some pounds in weight. Suddenly, however, he was overcome with an attack of jaundice, accompanied with severe pains and fever. Since that time the pains were more constant than previously, and remained so even after the jaundice had entirely disappeared. The patient's condition turning from bad to worse, a consultation was held with Drs. A. Rose and F. Lange, and an exploratory laparotomy was decided upon, gall-stones apparently being at the bottom of the trouble. The operation was performed by Dr. F. Lange in my presence. No gall-stones were found. The liver appeared normal. On examining the stomach, however, a small spot (the size of a twenty-five-cent piece), situated in the anterior wall about three inches distant from the lesser curvature as well as from the pylorus, was found necrotized and on the border of perforation. This piece was excised and a typical ulcer found. The stomach was sewn together. The patient got along nicely for the first week after the operation when pneumonia developed, which caused a fatal issue.

Ewald, though a fervent advocate of the last theory, presupposes a predisposition of certain persons to this affection in order to explain the many instances where the theory of hyperacidity would not apply.

The probability is that gastric ulcer is not always produced by one and the same factor, and all the above theories may apply more or less in different instances.

Morbid Anatomy.—The peptic ulcer is found only in those regions which are exposed to the gastric juice. Aside from the stomach it is met with in the lowest part of the œsophagus and in the upper part of the duodenum. The typical gastric ulcer has a round or oval (sometimes oblong) appearance. It extends to various depths of the gastric wall, the upper part being the larger, the inferior smaller, presenting in this way more or less the shape of a funnel.

A typical ulcer looks as if it were cut out with a punch. In most instances the base of the ulcer is smooth, occasionally it is covered with tenacious greenish or brownish mucus. In microscopic sections through the margins of a recent ulcer, the ducts of the glands appear as though cut off toward the base of the ulcer. They are eaten away or digested up to the point where the tissues offer sufficient resistance to the digestive power of the gastric juice. In older ulcers, however, a reactive inflammation sets in at the periphery, leading to the formation of a callous margin. The latter may become very much indurated, and may give on palpation the impression of a tumor, the more so if the thickened portion be situated near the pylorus. Aside from the inflammation of the narrow margin of the ulcer, the mucous membrane of the whole stomach remains in most instances normal, this being according to Rosenheim[1] a principal char- eristic of ulcer, which unlike cancer consists in a

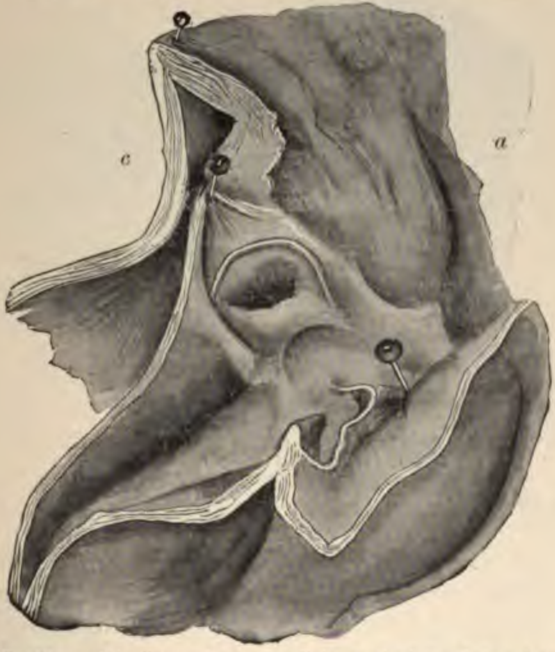

Fig. 39.—Ulcer of the Stomach near the Pylorus, the latter being stenosed. *a*, Stomach; *b*, pylorus; *c*, ulcer. (From writer's observation.)

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h. Rosenheim: "Pathologie und Therapie der Krankheiten der röhre und des Magens," Wien und Leipzig, 1891, p. 161.

well-circumscribed necrotic process having no further influence upon the gastric mucosa.

The size of the ulcer is rarely much smaller than a

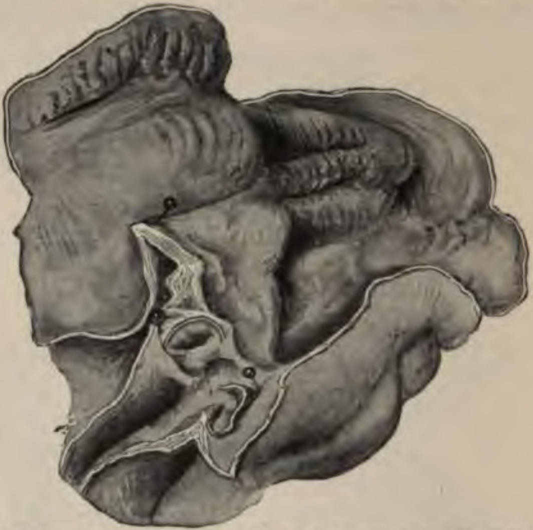

Fig. 40.—The same specimen drawn in smaller proportions, in order to show the surroundings of the ulcer.

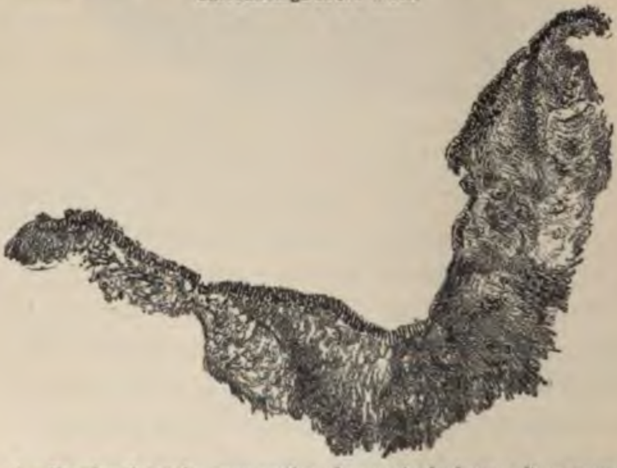

Fig. 41.—Showing the entire cross-section of an excised ulcer as it appears under the lens. The concave line forms the interior, the convex the outside of the stomach. The middle portion is deprived of the glandular layer; to the left a few glands are left. × 4. (From writer's observation.)

five-cent piece or larger than a twenty-five-cent piece, although no precise limits can be given. Thus an ulcer not larger than a pea may exhibit all the characters of this lesion, while conversely an ulcer may gradually attain a diameter of five or six inches. Debove and Rémond[1] mention a case of gastric ulcer of the size of the palm of the hand.

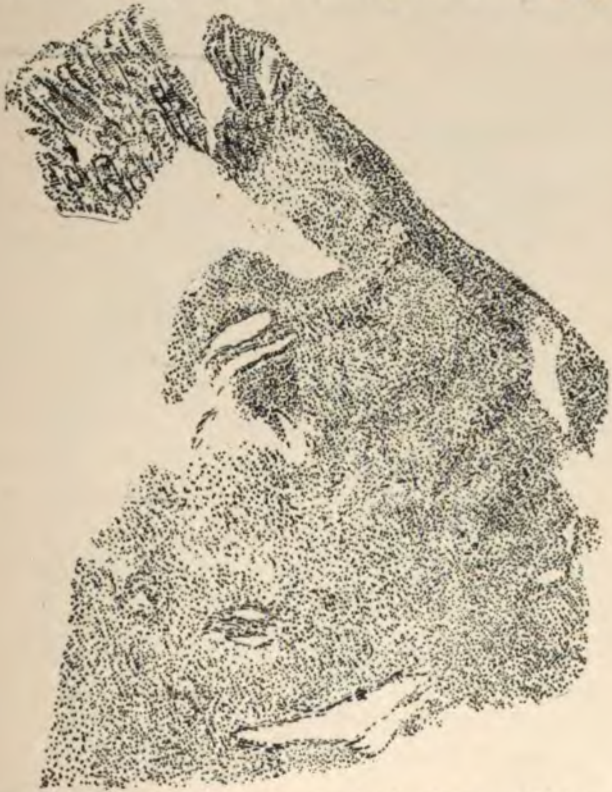

FIG. 42.—The left corner of Fig. 41, as seen under the microscope with low power. Glands are visible to the left of the drawing, the rest consisting principally of a proliferation of cells and connective-tissue formation.

Situation of the Ulcer.—According to Brinton,[2] gastric ulcer occupies the various parts of the stomach in the following frequency: In 43 cases out of 100 the posterior surface, in 27 cases the lesser curvature, in 16 cases the pyloric extremity, in 6 cases both the anterior and posterior surfaces, often at opposite places; in 4 cases the anterior surface only, in 2 cases its greater curvature, in 2 cases the cardiac pouch.

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[1] Debove et Rémond: "Traité des Maladies de l'Estomac," Paris, p. 255.

[2] W. Brinton: *l. c.*

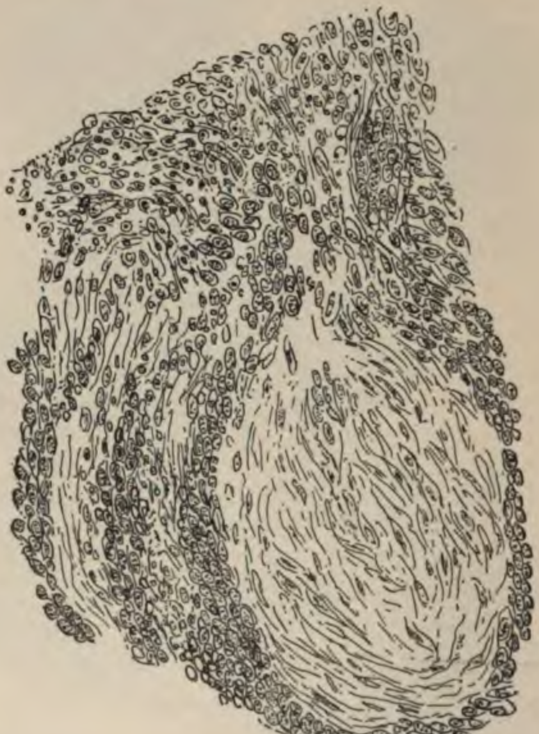

FIG. 43.—Showing One Spot of a Proliferation of Cells lying in the Centre of the Specimen (Fig. 41) resembling very much a spindle-cell sarcoma. Highly magnified.

Thus about 86 ulcers in every 100 occupy the posterior surface, the lesser curvature, the pyloric sac, parts of the stomach which together form a segment of less than half of the total superficies of the organ.

Hence we may estimate that any part of this continued (but irregular) segment of the stomach is on an average about five times more liable to the lesion than the remaining segment formed by the cardiac sac, the anterior surface, and the greater curvature.

Nolte's[1] figures do not harmonize with those just given. Nolte presents the following scale of frequency: At the greater curvature, 22; at the pylorus, 13; at the anterior wall, 3; at the posterior wall, 2; at the cardia, 1.

Welch's statistics harmonize more with Brinton's figures. Out of 793 cases collected by this eminent American writer, 288 ulcers were situated in the lesser curvature, 235 on the posterior wall, 95 at the pylorus, 96 at the anterior wall, 50 at the cardia, 29 at the fundus, 27 on the greater curvature.[2]

Number.—As regards the number of ulcers, according to Brinton, 2 or more are present in 1 out of every 5 cases, or about 21 per cent. Out of 97 such plural cases (corresponding to 463 instances of ulcer), in 57 there were 2 ulcers, in 16, 3, and of the remaining 24 in which "several" ulcers were present, 3 cases offered 4 and 2 cases 5 ulcers each; while in 4 there is reason to suppose even this number was exceeded.

Further Progress of the Ulcer.—1. Cicatrization. The ulcer, as a rule, does not heal with restitution of the normal mucous membrane, but leaves behind a fibrous, centrally depressed scar, which has a tendency to contract. If such a scar be situated at the pylorus, its contraction may produce stricture of this outlet. If the ulcer had a girdle-like shape, constriction of the viscus may occur, and give it the form of an hourglass.

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[1] Nolte: See Ewald, *l. c.*, 239.

[2] Welch: Cited from Osler's "Practice of Medicine," p. 369.

2. Progressive Necrosis and Corrosion. If cicatrization does not occur, the necrotic process may continue for a long period and may cause the following complications:

(*a*) Corrosion of vessels. Vessels of larger or smaller calibre may become opened and give rise to hemorrhage, or if a very large vessel is affected even to fatal bleeding. Among those more frequently involved are the gastric, splenic, and pancreatic arteries.

(*b*) Adhesions to neighboring organs and perforations. As soon as necrosis extends to the serosa, it leads either to a reactive inflammation with adhesions to surrounding organs and extension of the process to them, or where circumstances do not permit such adhesions, to a direct perforation into the abdominal cavity. After the adhesions have formed, a perforation may yet take place into a neighboring cavity. Thus perforation into the pleural or pericardial cavities occurs, or sometimes a fistula is formed between the stomach and duodenum or colon. According to the site of the ulcer, any of the neighboring organs, liver, gall bladder, pancreas, spleen, diaphragm, heart, lungs, etc., may become subject to these adhesions. Perforations of the anterior wall of the stomach are most dangerous on account of the greater mobility of this part of the organ and the consequent lack of adhesive inflammation. These, as a rule, terminate fatally.

Symptomatology.—A typical case of gastric ulcer is ushered in by disturbances of the gastric digestion. At the beginning there is merely a feeling of uneasiness and pain in the epigastric region; but these are soon followed by nausea and regurgitation or vomiting. These symptoms may undergo no change for a long period; at times, however, they become more severe in character. The pains especially take on a more aggravated form, and many patients are afraid to eat on account of them. Very often a hemorrhage from the stomach occurs, producing an increase of the anæmia and cachexia which already exist in consequence of subnutrition. If the disease takes a progressive course, it is liable to end lethally by perforation, hemorrhage, or by inanition. In most instances, however, the course of the disease is cut short either by a spontaneous cicatrization of the ulcer, or by the same process being brought about by our rational means of treatment. The symptoms then gradually disappear, and recovery takes place. In many instances the symptoms of the disease reappear after the lapse of various periods of time (one or several years). It is then quite difficult to decide whether we have to deal in these instances with the formation of new ulcers, or a breaking down of the cicatrix of the old lesion. As the above-mentioned symptoms of ulcer are met with likewise in many other disturbances of the stomach, and inasmuch as each of them has its specific character in the different lesions, it will be best to analyze each of the symptoms of gastric ulcer separately.

1. *Pain* is the most frequent and characteristic of all the symptoms. In the earlier stage of the disease there is a mere feeling of weight or tightness in the epigastric region. Sometimes the patient has the impression as though the food experienced a stoppage there. From such a dull, continuous feeling the pain gradually augments into a burning sensation and at last into a gnawing pain.

In the majority of cases the pain comes on from two to ten minutes after deglutition of food and remains during the period of gastric digestion, at the close of which it gradually subsides and disappears. There are, however, exceptions to this rule, and we find cases of typical gastric ulcer where the pains appear half an hour or an hour or two and three hours after meals. Different kinds of food have a marked influence upon the pain. Coarse substances and many undigestible foods increase the pain, whereas a liquid diet, especially milk, may fail to bring on the pain. The quantity of food is also of import, a large meal causing more pain than a small one.

The situation of the pain corresponds, as a rule, to the centre of the epigastrium, or to the median line of the abdomen immediately below the free extremity of the ensiform process. The portion of the epigastric region to which the pain is referred forms a circular area of rarely more than two inches diameter, sometimes a mere spot of less than half this size. There are, however, exceptions to this rule, and a spot of pain may be situated a little more to the right or to the left or also farther down than the above-described spot. Occasionally the pain is associated with a feeling of violent pulsation or throbbing in the epigastric region. At times this sensation is felt independently of the paroxysm of pain.

The dorsal pain, first described by Cruveilhier, is also an important symptom. It generally appears later (a few weeks or months) than the epigastric pain, and is then almost as constant and characteristic as the epigastric pain. This pain is gnawing in character and situated, as a rule, to the left of the spine corresponding to the eighth or ninth dorsal vertebra, and extending occasionally to that of the first or second lumbar vertebra. Like the epigastric pain, it has a fixed seat, generally remaining near the spot of its first appearance during the whole progress of the disease, although it also shows lateral as well as vertical deviation from its ordinary situation. Its worst attacks generally alternate with those of the epigastric pain.

The epigastric pain is increased on pressure. Even slight pressure with the finger upon the epigastric region below the ensiform process produces intense pain. This is the most important point characteristic of gastric ulcer. To test the sensitiveness to pressure by means of Boas' algesimeter, or to exert considerable pressure with the fingers, is not advisable. I perfectly agree with Brinton,[1] who says in reference to the latter point: "It is not altogether superfluous to add another caution with respect to the above test (pressure): not only must it be applied with great care and delicacy in the first examination of a supposed case of gastric ulcer, but, as a rule, we can scarcely be too reluctant to repeat it, even to verify a presumed amendment. At any rate, its effects are sometimes so injurious that it is necessary strictly to prohibit the patient from all manipulations of the epigastric region, as well as from all pressure produced by dress (such as stays in the female) or work (as is the case with shoemakers)."

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[1] W. Brinton: *l. c.*

The character of the pain, of becoming increased on pressure, is, however, not always present, and we find patients with gastric ulcer in whom the pain is rather subdued by pressure.

2. *Vomiting.* Vomiting in gastric ulcer occurs in nearly the same proportion of cases as pain. As a rule, it is absent during the first period of the disease, and appears somewhat later than the pain. Sometimes, however, both these symptoms occur simultaneously. The vomiting, most frequently met with in cases of ulcer, appears an hour or two after meals, at the time when the pain has reached its acme. As a rule, the vomiting relieves the pain. Sometimes the vomiting occurs less frequently, for instance once a day or still more seldom. The vomited matter ordinarily consists of a watery fluid mixed with particles of food. Occasionally, however, the latter are absent and the ejected matter then consists, as a rule, of clear gastric juice which, in many cases of ulcer, is secreted in too abundant a quantity. In such instances the vomiting may occur independently of the meals, and thus may take place either in the middle of the night or early in the morning on arising.

There are also cases in which vomiting takes place very soon after meals, or where, instead of the vomiting, there is regurgitation of food. The regurgitation may also occur two to three hours after a meal (the fluid brought up consisting of very acid gastric chyme or juice) and is very often accompanied by pyrosis. Again there are cases in which instead of the vomiting we have spells of nausea. Vomiting of very large quantities of chyme, although met with in gastric ulcer, is most characteristic of cases of ulcer complicated with stenosis of the pylorus, and will be discussed later on when dealing with that affection.

3. *Hemorrhage.* Hemorrhage is a symptom of the greatest importance in gastric ulcer. Since the process of ulceration implies a solution of continuity in the coats of the vessels of the stomach, there is nothing more natural than an effusion of blood. As a rule, however, the opening of the vessels is very soon obliterated by the formation of a coagulum. For this reason hemorrhages occurring from the very small vessels are not of much import, and pass unnoticed by the physician or the patient. It is only when a larger vessel is corroded and a considerable quantity of blood enters the stomach that grave symptoms appear. In a typical case of such a hemorrhage the patient experiences a sensation of fulness soon after a meal, combined with anxiety. Some time afterward he feels nauseous, restless. Suddenly vomiting of a large quantity of blood occurs, having either a clear red, brownish, or black color, possibly mixed with food emesis). The patient, as a rule, feels faint, his nes pale, his extremities grow more or less

cold, and if the hemorrhage goes on uninterruptedly, death is likely to occur in consequence of the profuse loss of blood. Under such circumstances the patient soon becomes unconscious, convulsions supervene, and life is gradually extinguished. If hemorrhage of a large vessel has taken place, it may even happen that the patient dies before any vomiting has occurred. In such instances the cause of death, if there have been no previous symptoms of ulcer, usually remains unknown until the autopsy, when the stomach may be found filled with liquid or coagulated blood. In most cases, however, gastric hemorrhage is not lethal. The blood, instead of being vomited, may pass into the intestines, and be evacuated with the stools, which then assume a blackish, tarry color (melæna). Very often both hæmatemesis and melæna take place.

Blood vomiting (hæmatemesis), if present, is the most certain sign of ulcer, and its occurrence alone is sufficient to warrant a positive diagnosis of this affection. In almost one-third of his cases of ulcer, Anderson[1] found this symptom present. There is no doubt that hemorrhages in gastric ulcer appear more frequently than we are able to recognize their existence. Very often in small hemorrhages the blood will pass through the digestive canal unnoticed, the reason being that small quantities of blood mixed with alimentary residues may be changed in such a way as to be unrecognizable. Even if blood be present in the stools in larger amounts, it will sometimes pass unnoticed because the patient does not pay attention to their color, especially nowadays when every one goes to the water-closet, and is not in the habit of inspecting his passages. Not long ago I had the opportunity twice of detecting blood in the stomach of patients who apparently never had any hemorrhages. In one of them, at the examination with the tube one hour after the test breakfast, I obtained quite a quantity of blood having a black coffee-ground color (under the microscope red blood corpuscles were present). The second patient was a lady presenting symptoms of gastric ulcer. While in the clinic, I noticed that she looked unusually pale; she also complained of feeling somewhat faint. As she had partaken of a test breakfast, I administered the stomach bucket, which came up filled with a fluid of coffee-ground color, also containing red blood corpuscles.

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[1] Anderson: British Medical Journal, May 10th, 1890.

4. *Appetite.* Although patients with gastric ulcer partake of very small quantities of food, the appetite *per se* is by no means decreased. It is merely on account of the pains that the patients are afraid to eat, and avoid substantial meals. Some complain of being constantly hungry, but unable to satisfy their appetite, on account of the distress following the ingestion of food. This fear of taking food is sometimes exaggerated, and the patients get into a habit of partaking of so little that the danger resulting from this source is certainly far greater than that from the original disease.

5. *Constipation.* As a rule, most cases of gastric ulcer are accompanied by constipation. Leube[1] explains this fact in the following manner: He assumes that the peristalsis of the stomach is impaired in gas-

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[1] Leube: *l. c.*

tric ulcer. As there is a reflex connection between the peristalsis of the stomach and that of the small intestines, the latter will also be retarded, and in this way the constipation would be explained. Leube's theory of the presence of retarded muscular action in gastric ulcer seems to be supported by several results which I have obtained with the gastrograph in a few cases of gastric ulcer, in which the motion of the stomach appeared to be materially lessened. My observations in this respect, however, are yet too few to fully sustain this theory.

6. *Amenorrhœa.* Amenorrhœa is quite frequently met with in women suffering from gastric ulcer. It appears, however, that this symptom is merely the consequence of the anæmic condition of these patients. Sometimes gastric hemorrhages vicariously appear instead of the monthly periods.

7. *Cachexia.* Although we sometimes meet with robust, healthy persons suffering from gastric ulcer, this is not the rule, and most frequently patients suffering from this trouble present an appearance which would suggest to an observant physician even at a distance the nature of the ailment. In connection with the extreme cachexia, the sharp lines which severe and frequent pains, together with partial starvation, have graven on the patient's face afford almost a characteristic sign of gastric ulcer. The cachexia in gastric ulcer, although at first not well marked, may after a time increase to such an extent that the patient is reduced to a mere skeleton, and emaciation of this kind is very seldom met with in gastric cancer.

Condition of the Gastric Contents.—Riegel, and later Jaworski and Glusinsky, first signalized the fact that hyperacidity is a concomitant factor of gastric ulcer. Although this is not always the case, as we have mentioned above, the fact remains true that most of the cases of gastric ulcer are characterized by an hyperacid juice. The acidity may reach as high a figure as 130 or even 160 (about three or four times the acidity of normal gastric juice). This high figure, 160, I had the opportunity to observe lately in a case of gastric ulcer near the pylorus combined with stenosis of the latter. The patient had been operated upon, and the diagnosis verified *in vivo* in this manner. In cases in which there is vomiting the ejected matter should be examined. If vomiting is absent the gastric contents may be obtained for examination with the stomach bucket. The examination of the gastric contents by means of any instrument should be performed with the greatest caution, and only in those instances where the diagnosis of gastric ulcer is doubtful. Whenever there are sufficient symptoms to make the diagnosis pretty certain, the employment of an instrument should be omitted. Most writers are opposed to the application of the tube in gastric ulcer.

Latent Ulcer.—All the above symptoms of gastric ulcer may at times be missing, and the sickness may remain concealed. It is well known that scars resulting from ulcer are found at autopsies in the stomachs of people who apparently never had any gastric trouble.

The following is a good example of an ulcer without pical subjective symptoms, showing at the same time the importance of hemorrhage as a diagnostic sign:

Mrs. H——, 44 years old, has been complaining for the last five years of frequent belching, poor appetite, and constant pains of a *very slight character* in the epigastric region. Patient never had any hemorrhage nor any intense pains, and her bowels were always regular. During her illness she has lost eight pounds, and looks extremely pale and anæmic. The examination of the abdomen reveals the position of the stomach between the navel and one finger's width above the pubes. There is no pain on pressure either in the epigastric or gastric region, although the epigastrium is somewhat sensitive to pressure. Right kidney movable. Examination with the tube one hour after the test breakfast results in the withdrawal of coffee-colored contents mixed with fine particles of bread; the microscope shows numerous red blood corpuscles; the chemical analysis of the filtrate reveals HCl+acidity =76. On the next day the patient's stools were black from admixture with blood.

The diagnosis of gastric ulcer was made and the patient treated accordingly. She gradually recuperated, and under a further tonic treatment entirely recovered, and has remained free from any symptoms for the last two years.

Again, such a latent ulcer may sometimes suddenly give rise to alarming symptoms, and even cause death from perforation or a profused hemorrhage.

Duration of the Disease.—The duration of gastric ulcer is sometimes extremely long. Brinton cites cases in which the sickness had lasted from thirty to thirty-five years.

Complications.—Complications quite frequently appear during the protracted course of this affection. These may comprise a sudden exacerbation of one of the usual symptoms, as for instance the pain or vomiting, which may become uncontrollable, and hemorrhage, which may become fatal in a few hours or even in a few minutes. Again, they are sometimes caused by intercurrent phenomena.

Perforation.—The most dangerous complication of gastric ulcer is perforation, which is due to an extension of the ulcerative process through the whole stomach wall to the peritoneum. It is followed by sloughing or rupture of these delicate membranes, and by the effusion of the contents of the stomach into the peritoneal cavity. The perforation is accompanied by very intense and characteristic symptoms. The patient is suddenly attacked by a violent pain, which begins in the epigastric region, and rapidly spreads over the abdomen. Sometimes the patients have a sensation as if something had given way in their abdominal cavity, and a gush of liquid had occurred. Symptoms of general peritonitis now quickly appear. In a short time the whole abdomen becomes greatly distended and extremely painful to the slightest touch. Entrance of gas into the abdominal cavity occurs, in consequence of which the dulness of the liver sometimes disappears; at times, again, emphysema of the skin develops. The extremities become cold, while the temperature of the body rises. The pulse becomes very small and can hardly be counted. A cold sweat s out on the face, which wears an expression of anxiety (facies Hippocratica); singultus is present, as a rule, while vomiting may at times be absent (in those instances where the entire contents of the stomach have escaped into the abdominal cavity). After a short period of coma the patient usually dies. Rarely does the train of symptoms following perforation offer a marked deviation from the above description. In many instances, a remarkable paroxysm of pain precedes the occurrence of perforation. This pain, the duration of which varies from a few minutes to several hours, is generally due to a leakage of the gastric contents through the thin film of rotten tissue, to which at this period the coats of the stomach are reduced. Partial perforation, allowing of a subsequent repetition of the accident, or leading to abscess, presents symptoms of a more local, more chronic, and less intense character than those of ordinary perforation. Perforation nearly always occurs after a full meal, and is often traceable to mechanical violence, such as coughing, sneezing, or constriction of the abdomen.

Sometimes, before the perforation arises, an adhesive inflammatory process takes place, in consequence of which the stomach in the affected area becomes adherent to neighboring organs, a process which may then prevent the entrance of the gastric contents into the peritoneal cavity. A local abscess is very often the result of such an occurrence. This form of abscess may open into different cavities; thus, for instance, a fistulous opening between the stomach and the colon, or the stomach and the abdomen, has frequently been found established. Again, the abscess may perforate the diaphragm and lung, and be evacuated in this way. As these instances are not so very frequent, I will here mention a case of this kind which I observed ten years ago.

A lady, about 30 years old, after a short period of slight dyspeptic symptoms, was suddenly attacked with profuse gastric hemorrhages. On the first day she vomited about one pint and a half of almost clear blood, the vomiting being accompanied by severe pains in the gastric region. She was kept in bed, an ice-bag applied to her abdomen, and large doses of opiates were administered. On the following day the hæmatemesis was repeated. Under the above treatment, however, the patient began slightly to improve and to take small quantities of milk. About a week after the first hemorrhage she suddenly experienced a more intense pain in her abdomen, followed by all the symptoms of severe collapse. Singultus appeared, the abdomen swelled, and became extremely painful to the touch, while the temperature rose to 104°, the pulse to 140, and the extremities grew cold. The diagnosis of perforation of the ulcer was quite clear, and the patient was believed to be dying. This critical state remained unchanged for about four or five days, when suddenly the dyspnœa, which had before existed in a slight degree, increased, while the expired air assumed a very offensive odor. This symptom increased to such a degree that it was hardly possible to sit in the same room with the patient. About two days later, during which period the offensive smell constantly persisted with undiminished strength, the patient brought up during several spasmodic coughing-spells about one pint and a half of pus, in which particles of casein and small black flakes could be clearly seen. This matter had exactly the same odor as the air expired by the patient for the last two days. Immediately after this occurrence the expired air entirely changed its character, and the atmosphere of the room was no longer unpleasant; the patient began to feel better, the temperature fell, all the symptoms of peritonitis began to disappear, and she made a slow recovery in about six weeks. In this case after the perforation of the stomach there must have formed a localized abscess, which extended through the diaphragm into the lung and emptied itself through a bronchus.

By a similar process an abscess may form beneath the diaphragm, and may at times cause a condition which Leyden[1] designated as "*Pyopneumothorax subphrenicus*" on account of its similarity to the real pyopneumothorax. This condition appears only when gas is contained in the abscess. Debove and Rémond[2] designate it by the more correct term "gaseous subdiaphragmatic abscess," while in this country it is briefly called "subphrenic abscess." The abscess is, as a rule, situated toward the right side. Its walls are formed by the diaphragm above, by the liver and the stomach below; to the right it is surrounded by the suspensory ligaments of the liver, and to the left by the spleen. The liver is usually pushed downward and the diaphragm upward. Thick false membranes form tho walls of the abscess, which contains gas and fetid liquids, the latter being composed of pus and alimentary residues.

The symptoms that are caused by this condition are: the respiratory vibrations of the lower part of the thorax disappear; the liver dulness in the back and the lower part of the lung are replaced by a zone giving a tympanitic sound on percussion. On auscultation the respiratory sounds are not audible, but there are heard instead succussion sounds of a metallic pitch. The best diagnostic sign of this condition is afforded by exploratory puncture, by means of which one can aspirate pus containing some food particles. Another diagnostic point of value has been suggested by Pfuhl,[1] and consists in connecting the exploratory needle with a manometer. The pressure in this affection is greater during inspiration and less during expiration, whereas in real pyopneumothorax this condition of pressure will be found reversed. Of late this disease has been recognized during life and successfully operated upon by incision of the abscess and cleansing of the cavity. C. Beck,[2] of New York, has recently reported three successfully operated cases of subphrenic abscess.

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[1] E. Leyden: "Ueber Pyopneumothorax subphrenicus und subphrenische Abscesse." Zeitschr. f. klin. Med., 1880, p. 320.

[2] Debove et Rémond: *l. c.*, p. 272.

The local abscess caused by perforation can also at times produce other complications; thus, for instance, it may perforate the abdominal wall, with establishment of a fistulous opening from the stomach to the outside. Although very rare, cases are also mentioned in which an abscess of the stomach has perforated the pericardium, and even the heart itself, causing death.

As regards the frequency of perforation in the course of gastric ulcer, it occurs, according to Brinton, in not more than one out of seven or eight cases of this lesion; while sex has no influence upon the frequency of its occurrence, the age of the patient seems to play an important part in this respect.

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[1] Pfuhl: Berliner klin. Wochenschrift, 1877, p. 57.

[2] C. Beck: Medical Record, February 15th, 1896.

Although gastric ulcer is met with more frequently as life advances, the occurrence of perforation, on the contrary, declines from the age of 30 to that of 70. According to Brinton, the distribution of the liability to perforation over the whole life varies materially in the two sexes. In the female about one-half of the number of cases occur between the ages of 14 and 30, one-third in the six years between 14 and 20. In the male the distribution is constant up to the age of 50, and diminishes but little up to that of 70. The average age of those subject to perforation also differs in the two sexes, being 27 in the female, 42 in the male. The situation of the perforating ulcer plays the chief part in the frequency of this occurrence. The anterior surface of the stomach, though much more rarely affected by ulcer, is yet one of the most frequent sites of perforation. According to Brinton, in all other situations of the ulcer, the probabilities are about 60 to 1 against perforation, while in the anterior surface of the stomach, they are 6 to 1 in its favor. The reason for this is the circumstance that the front wall of the stomach is more exposed to motion than all other parts of the stomach where ulcer is usually found. The mobility of this part prevents the formation of adhesions, which often form if the ulcer is situated elsewhere.

The gastric ulcer is liable to bring in its train still other complications: thus in some instances a cancer may be developed on the base of an ulcer or on its scar. Dittrich was the first to describe this complication, and Rosenheim[1] has lately published several important investigations on this subject. The same writer[2] has also described another complication of chronic gastric ulcer, and that is a grave form of anæmia, which may be styled "pernicious."

Pulmonary tuberculosis is a frequent occurrence in gastric ulcer, as in many other chronic diseases, and hastens the death of the patient. It does not seem, however, that there is a more intimate connection between these two affections than obtains in other diseases.

As mentioned above in speaking of the pathology of the ulcer, severe complications may arise from the thickening of a cicatrix, especially if situated at the pylorus, or very near it, or again at the cardia. In the first instance, the most frequent complication is stenosis of the pylorus with dilatation of the stomach, which will be treated in a special chapter under Ischochymia; in the second, stricture of the cardia, causing dysphagia.

Diagnosis.—In cases where all the symptoms of gastric ulcer are present no difficulty will be experienced in the diagnosis. It frequently happens, however, that only one or two of the above-described symptoms exist, and it is then more difficult to make a positive diagnosis. One of the following symptoms, if present in its characteristic form, will suffice to establish a probable diagnosis of ulcer.

1. Hæmatemesis. If the quantity of blood vomited

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[1] Th. Rosenheim: "Zur Kenntniss des mit Krebs complicirten runden Magengeschwürs." Zeitschr. f. klin. Med., Bd. 17, p. 116.

[2] Th. Rosenheim: Deutsche med. Wochenschr., 1890, No. 15

be quite large, and cancer of the stomach can be excluded.

2. Pains. Pains appearing shortly after meals, and lasting for a considerable time (two to three hours), being influenced by the quantity and quality of food in such a way that they are most intense after the ingestion of coarse substances in large quantities, without perfectly free intervals of several days' duration, are sufficient to warrant the suspicion of gastric ulcer. If in connection with this spontaneous pain there is a circumscribed spot in the epigastric region that is painful to pressure, or if there is a small area likewise painful to pressure to the left of the eighth or ninth dorsal vertebra, then the diagnosis of an ulcer becomes probable.

3. Vomiting. Vomiting appearing shortly after meals and preceded by a period of uneasiness in the gastric region, may also at times be suspicious of gastric ulcer. If this occurs in individuals who have lately grown much paler and more anæmic, the suspicion again becomes a probability. This probability is still greater if the gastric contents show a too high degree of acidity.

Differential Diagnosis.—Very often cases of pure nervous gastralgia, of hyperchlorhydria, and of cancer present symptoms similar to those of gastric ulcer, and in making the diagnosis we shall have to take all these affections into consideration. Following Ewald's example, I deem it best to give all points of differential diagnosis between the above-named conditions in a table:

	Gastric ulcer.	Nervous gastralgia.	Hyper-chlorhydria.	Cancer.
Age.......	Rare in youth, frequency increasing progressively from puberty to a very advanced age.	Most frequent between the ages of 18 to 35.	Met with in all periods of life, except in youth, when it is quite rare.	Middle age and advanced life.
Sex.......	More frequent in women (2 : 1).	More frequent in women.	More frequent in men.	No marked difference between the two sexes.
Epigastric pain.	Quite intense; appears shortly after meals; grows severer on pressure; disappears at the end of the digestive period; seldom perfectly free periods.	The pain appears without regularity and is not in any way dependent upon the meals; is relieved by pressure and shows intervals of several days' duration which are perfectly free from pain.	The pain appears about two to three hours after meals and disappears after partaking of some food (especially meat, milk, egg) or after the administration of bicarbonate of soda.	The pain is less intense in character but more steady; there are seldom free intermissions during which no distress is felt in the gastric region.
Appetite..	Appetite not impaired, although patient as a rule eats less on account of his suffering.	Variable.......	Often increased.	Appetite, as a rule, very poor.
Tongue...	Dry and red, showing a white stripe in the middle, or smooth and moist or slightly furred.	Presents a normal appearance.	Is either clean or slightly furred.	Almost always thickly coated.
Taste	Nothing abnormal...	do.	do.	Very often bitter or sour.
Belching..	As a rule absent; if present, without any bad odor.	do.	do.	As a rule present and very often associated with a disagreeable, even fetid odor.
Regurgitation.	At times present, frequently water brash associated with pyrosis.	Not present ...	Water brash and pyrosis quite frequent.	No water brash; pyrosis quite intense.
Vomiting..	Appears in some cases soon after meals.	Shows no regularity in its appearance.	No vomiting..	The vomiting, as a rule, occurs not after each meal but once or twice a day or once in two days, the quantity being often very large.
Hæmatemesis.	Vomiting of a large quantity of blood, either clear red or of coffee-ground color. Blood is also found in the stools. A repetition of the hæmatemesis may occur on the following day, but if once arrested it does not reappear for quite a long period.	No vomiting of blood.	No vomiting of blood.	Vomiting of blood occurs; the quantity is relatively small, the color ordinarily coffee brown. The blood appears in a decomposed condition, presenting frequently a fetid odor. The vomiting often recurs with short intermissions.

	Gastric ulcer.	Nervous gastralgia.	Hyper-chlorhydria.	Cancer.
Secretory function	1. Gastric juice as a rule increased.	Variable.......	Increased	As a rule, highly decreased.
	2. Lactic acid absent.	Absent	Absent	As a rule, present.
Tumor....	No tumor; rarely, however, if the ulcer is near the pylorus, the latter becomes thickened and can be felt as a smooth, lengthy body.	No tumor	No tumor......	Tumor very frequently palpable; presenting, as a rule, an uneven surface; is painful to pressure and easily movable.
Perforation.	Perforation might take place after a short period of illness.	No perforation.	No perforation.	Perforation occurs only in the last stages of the disease.
Complexion.	Complexion commonly fresh, but anæmic after severe losses of blood	Complexion pale.	Complexion pale.	Complexion sallow and yellowish; skin dry; marked cachexia.

Localization of the Ulcer.—As above mentioned in speaking of the pathology, the ulcer may be situated at different points of the stomach walls, or at the pylorus, the beginning of the duodenum, the cardia, or the lower end of the œsophagus. The exact site of the ulcer can be determined with certainty only in rare instances. Most frequently we remain in doubt with reference to this point of diagnosis. There are, however, several symptoms which can be utilized with regard to a probable diagnosis as to the situation of the ulcer. 1. Frequently patients experience relief from their pains in assuming a certain position. Thus, for instance, some feel easier in lying on the back, others less uncomfortable when they lie upon their abdomen. Again, some feel no pain in standing, but the latter appears when they assume a recumbent position. In a few, again, this is reversed, the pain appearing in the standing and disappearing in the recumbent position. As a rule, we may assume that the position in which the patient is most comfortable is the one which permits the ulcer to remain above the gastric contents, and to come least in contact with them. Hence an ulcer situated at the lesser curvature will be diagnosed if the patient experiences relief in standing. Again, an ulcer of the greater curvature will be suspected if the pain is most intense on standing. The site of the ulcer will be suspected to be in the cardiac portion of the stomach if the patient has less pains when lying on his right side, and in the pyloric region if the pains are less severe when he occupies a left-sided position. 2. Pains appearing directly after the deglutition of food, and associated with vomiting immediately after meals, particularly point to an ulcer in the cardiac region or in the lowest part of the œsophagus. 3. Pains appearing two or three hours after meals, referred partly to the right of the epigastric region and associated with melæna (bloody stools), point to the situation of the ulcer either at the pylorus or the beginning of the duodenum.

Prognosis.—At first glance it would appear that the prognosis of gastric ulcer is quite good, especially nowadays, when the diagnosis of the affection is usually made at an early date. However, if we take into consideration the tabulated statistics given by Debove and Rémond[1] in reference to the outcome of all cases of ulcer, we will become more careful in our favorable predictions. This table gives in a hundred cases of ulcer:

Perfect cure, ...	50
Perforations and peritonitis, ...	13
Foudroyant hæmatemesis, ...	5

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[1] Cited from Debove et Rémond: *l. c.*, p. 276.

Pulmonary tuberculosis,	20
Inanition,	5
Different complications,	7

Treatment of Gastric Ulcer.—Cruveilhier, to whom we are indebted for the first thorough and accurate description of gastric ulcer, recommended milk as the most suitable food in this condition, and although many decades have since passed, milk still stands first in the dietary of these patients.

As rest is the foremost auxiliary in the treatment of most diseases, it appears natural to make use of this agent in ulcer. Leube and Ziemssen[1] deserve credit for having laid so much stress on this point and for having devised the "rest cure" for the treatment of ulcer. Although this mode of treatment had been practised long ago by W. Fox[2] and B. Forster in England, still Leube and Ziemssen have succeeded in popularizing the same, and that is the reason why it justly bears their name.

The Leube-Ziemssen rest cure for the treatment of ulcer consists in the following: The patient is kept abed for two to three weeks. He is poulticed during the day with flaxseed (warm) over the stomach and the upper part of the abdomen; at night a *priessnitz* (wet linen cloth) is substituted, covering the same area. The diet consists of liquids—milk, milk with strained barley, or oatmeal, or rice water, plain water, weak tea, and peptone (one teaspoonful to a cup of water). Debove and Rémond[3] have suggested the addition of lactose and of meat powder to the milk, in order to make the diet richer in nourishing substances. As a rule, we employ the above-named additions, which fulfil the same purpose, besides varying the monotonous bill of fare.

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[1] Leube: *l. c.*, p. 120.

[2] Wilson Fox: *l. c.*

[3] Debove et Rémond: *l. c.*, p. 284.

During the first week we give the patient half a cup (about 100–150 c.c.) of either every hour. Everything the patient takes must be neither cold nor very warm, and should be taken slowly (sipping or with a spoon). During the second week we order the same kind of food, with this difference, that he is nourished every two hours, and gets a cupful or a cupful and a half (200–300 c.c.) at a time. Occasionally we now allow the patient one raw egg beaten up in the milk, once or twice a day.

In the beginning of the third week we feed the patient every three hours; he is allowed barley, farina and rice (well cooked) in milk, soft-boiled eggs, crackers softened in milk, in addition to his previous food; on the third day of the third week we begin to give the patient meat, first raw, well scraped, then broiled. Thereafter we go over to the ordinary daily diet, excluding heavy salads, pastry, raw fruit, and the like.

In the following table I give an outline of diet which I ordinarily prescribe in this affection:

Outline of Diet in Gastric Ulcer.

	FIRST THREE DAYS.	Number of calories.
7 A.M.:	milk, 150 c.c. (five ounces),	101
8 “	“ “ “ “	101
9 “	“ “ “ “	101
10 “	milk and strained barley water (each), 150 c.c.,	80
11 “	milk, 150 c.c.,	101
12 “	“	101

		Number of calories
1 P.M.:	bouillon either alone or with the addition of one to two teaspoonfuls of a peptone preparation, 150 c.c.,	30
2 “	milk,	101
3 “	“	101
4 “	“	101
5 “	milk with strained barley or oatmeal,	80
6, 7, 8, 9 P.M.:	milk, 150 c.c.,	404
		1,402

FOURTH TO THE TENTH DAY.

		Number of calories.
7 A.M.:	milk, 300 c.c. (ten ounces),	202
9 “	“ “	202
11 “	“ with barley, rice, or oatmeal water, 300 c.c.,	160
1 P.M.:	one cup of bouillon, 200 c.c., and one egg beaten up in it,	80
3 “	milk, 300 c.c.,	202
5 “	“ “	202
7 “	“ with barley water, 300 c.c.,	160
9 “	“ 300 c.c.,	202
		1,410

ELEVENTH TO THE FOURTEENTH DAY.

		Number of calories.
7 A.M.:	milk, 300 c.c.,	202
9 “	“ “	202
	and two crackers softened (one ounce),	100
11 “	milk with barley water, 300 c.c.,	160
1 P.M.:	one cup of bouillon, 200 c.c., one egg, and two crackers,	180
3 “	milk, 300 c.c., and one egg,	282
5 “	“ “	202
	and two crackers,	100
7 “	milk with barley water,	160
9 “	milk, 300 c.c.,	202
		1,790

FOURTEENTH TO THE SEVENTEENTH DAY.

		Number of calories.
7 A.M.:	milk, 300 c.c.,	202
9 "	" "	202
	and two crackers (one ounce),	100
11 "	milk with barley, 300 c.c.,	342
1 P.M.:	scraped meat, 50 gm.,	60
	two crackers; one cup of bouillon, 200 c.c.,	100
3 "	milk, 300 c.c.,	202
5 "	" "	202
	one egg (soft boiled),	80
	two crackers,	100
7 "	milk with farina, 300 c.c.,	342
9 "	" 300 cc.,	202
		2,134

SEVENTEENTH TO TWENTY-FOURTH DAY.

		Number of calories.
7 A.M.:	two eggs (soft boiled),	160
	butter, 10 gm.,	81
	toasted bread, 50 gm.,	130
	milk, 300 c.c.,	202
10 "	" "	202
	crackers, 50 gm.,	166
	butter, 20 gm.,	162
1 P.M.:	lamb chops (broiled) 50 c.c.,	60
	mashed potatoes, 50 gm.,	44
	toasted bread, 50 gm.,	130
	butter, 10 gm.; one cup of bouillon, 200 c.c.,	81
4 "	the same as at 10 A.M.,	530
6:30 P.M.:	milk with farina, 300 c.c.,	342
	crackers, 50 gm.,	166
	butter, 20 gm.,	162
9 "	milk, 300 c.c.,	202
		2,820

At the beginning of the third week the flaxseed poultices are discontinued and the patient is allowed to be up, first for a short time only (half an hour to an hour), then for several hours, and afterward for the whole day. At the beginning of the fourth week the patient may begin to walk outdoors and gradually resume his daily work.

Leube and Ziemssen and most of the German writers recommend the use of either Carlsbad water (half a pint) or Carlsbad salt, 5 to 10 gm. in the same quantity of water, heated to 122° F., twice daily (the first portion being taken in the morning, the second at night before going to sleep). I do not believe that the Carlsbad salt is in any way essential. In most of my cases of gastric ulcer I have omitted the so-called Carlsbad drink cure, and have obtained results equally satisfactory as when the salt was employed.

In cases of ulcer of the stomach presenting a more severe type—violent pains, frequent vomiting, inability to take food on account of the pains—or after hæmatemesis, I usually have the patient abstain from any food whatever, given by the mouth, for a period of five days. The patient is then fed by the rectum. This is done in the following way: Early each morning the patient receives a large enema of about a quart of lukewarm water in which a teaspoonful of common table salt has been dissolved as a cleansing enema. About an hour after the patient has emptied the injected water the first nourishing enema is given; this may consist either of a glassful of milk (about 200 c.c.) in which a raw egg has been well beaten and a pinch of salt added, or of a cupful of water in which a tablespoonful of a good peptone preparation has been dissolved. The temperature of either must be about 100° F. Such a nourishing enema is given three or four times a day. The quantity of the feeding enema is 200–250 c.c., and it is slowly injected by means of a fountain syringe and a *soft-rubber* rectal tube. The patient may frequently wash his mouth with cold water, and is allowed from time to time to keep a small piece of chopped ice in his mouth, and to swallow the melted water. The five days being over, the mode of diet is the same as described above for the ordinary form of ulcer.

Whenever the "rest cure" is applied there is scarcely any need for constant medicinal treatment. Sometimes, however, we make use of a small dose of codeine if the pains are very severe, and of Carsbald salt if there is constipation. Only in cases where the ulcer is associated with a hyperacid gastric juice may we regularly administer an alkaline salt, as for instance:

℞ Magnes. ust., ... 5.0 (ʒ i.)
Sod. carbon. exsiccat.,
Sod. bicarbon.,
Elæosacch. menth. pip., ... āā 15.0 (℥ ss.)
M. exactissime, f. pulv. D. ad scatulam. S. A tip of a knife every two hours.

In chlorotic individuals the administration of an organic iron preparation (as for instance Pizzala's or Dietrich's Elixir of peptonate of iron or Boehringer's ferratin) is often very serviceable. Thus far we have spoken only of patients who can submit to the bed treatment. In patients who cannot afford to stay in bed, the following two methods, which are at present in vogue, may be tried. I have practised both of them, sometimes with good results.

The one is the "nitrate-of-silver" treatment, the other the "bismuth" treatment. During the use of either of these remedies the patient is allowed to attend to his business and partake of a light diet, in which milk plays a prominent part.

I. The silver nitrate is given first:

℞ Argent. nitr., ...	0.3 (gr. v.)
Aq. dest., ...	180.0 (℥ vi.)

D. in vitro nigro. S. A tablespoonful in a wineglassful of water three times a day, half an hour before meals.

After having used up this quantity, the dose may be gradually increased, prescribing 0.4–0.6 gm. of silver nitrate to 180 of water. The silver nitrate may be used in the way mentioned for about two or three weeks, and is then discontinued. The pains usually disappear after the completion of the first week's medication.

II. The subnitrate of bismuth. The bismuth has been used again and again in painful affections of the stomach, the dose being from 0.2 to 1.0 gm. several times daily. The French physicians recommended the use of much larger doses, giving 5 gm. three times daily. Fleiner[1] has lately laid much stress on the use of large doses of bismuth, suspended in water, in the treatment of ulcer, and Rosenheim[2] corroborated his views. I had the opportunity of applying this method quite frequently and was satisfied with the results.

We may give the patient from 3 to 5 gm. of bismuth three times a day, to be taken in a wineglassful of water, well shaken, half an hour before meals. It is best to have the patient lie quietly for about half an hour after having partaken of the powder. The bismuth treatment must be continued for about two or three weeks without interruption. It is remarkable that these large doses of bismuth do not, as a rule, cause constipation. In all of my cases with but few exceptions the bowels moved every day without the aid of any cathartic during the whole time of the bismuth medication. The bismuth treatment in ulcer seems to me to deserve high recommendation.

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[1] Fleiner: Verhandl. des XII. Congresses f. innere Medicin, 1893.

[2] Rosenheim: "Die neueren Behandlungsmethoden des Magens." Berliner Klinik, May, 1894.

Hemorrhage.—In cases of hemorrhage from the stomach the treatment is the same as in the severe type of ulcer, with the exception that ice-cold applications are made over the stomach instead of the warm poultices. Perfect rest is here absolutely necessary. The patient must keep very quiet and avoid any motion whatever; even turning from one side to the other is not permissible. The patient should be prohibited all conversation except it be to indicate his wants.

If the hemorrhage be profuse or if there are signs that the bleeding has not yet come to a standstill, hypodermic injections of ergot are advisable. One Pravaz syringe of the following should be injected two or three times a day in the gastric region:

℞ Extr. secal. cornut., ... 2.5 (ʒ ss.)
Aq. dest.,
Glycerin., ... āā 5.0 (ʒ i.)

Chloride of iron (5–15 drops in water) and acetate of lead 0.05 gm., one powder every two hours, which in olden times were used so frequently, do not in reality have much effect.

In case the hæmatemesis, however, recurs frequently, and the patient is running the risk of bleeding to death, Ewald[1] recommends resort to lavage with ice-cold water. For this purpose the pharynx must first be well cocainized, and the washing of the stomach then performed with the greatest care.

Collapse.—In case the patient has sunk into a collapsed condition, camphor or ether should be hypodermically injected. An enema of warm wine or warm wine with egg should be administered, and a hot-water bag applied to the feet. In those instances where the high degree of anæmia endangers the life of the patient, transfusion of blood was formerly frequently resorted to. Nowadays a subcutaneous injection of a physiological salt solution (4 to 6 NaCl to aq. dest. 1,000), in quantities from a pint to a litre, is used. The solution and the apparatus (fountain syringe) must be thoroughly sterilized, and one or two quite thick Pravaz needles used. The solution, warmed to blood temperature, is then injected into the subclavicular region.

Perforation.—If perforation has occurred perfect rest is absolutely necessary; nothing should be given by the mouth, ice bags should be placed over the abdomen, and large doses of opium, preferably in the form of suppositories, should be administered. In cases in which the stomach contains large quantities of food, Ewald suggests the washing out of the stomach, performed after cocainization of the pharynx and with all other necessary precautions. As soon as the symptoms of collapse appear, the above-described treatment is employed. The prognosis of perforation being so very unfavorable, notwithstanding all medicinal treatment, resort has been lately had to laparotomy, in order to master the situation surgically.

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[1] C. A. Ewald: *l. c.*, p. 274.

Surgical Procedures in the Treatment of Gastric Ulcer and its Sequelæ.—Gastric ulcer may occasionally take a very obstinate course, not being amenable to medical treatment. Again, its complications, hemorrhage (which may become very abundant or frequent) and perforation, greatly endanger life; the latter, in fact, almost always terminating fatally. Barling[1] says that ninety-five per cent of the patients having such perforations die, unless operated upon. For this reason Nelson C. Dobson[2] in 1883 advocated operative interference for a perforating ulcer according to one of the following methods. 1. Simple abdominal section with cleansing of the peritoneum, leaving the ulcer to heal of itself under rest and rectal feeding. 2. The closure of the perforation by suture, either with or without paring its edges. 3. The suture of the stomach at the point of perforation to the abdominal wall, in order to establish a gastric fistula.

A few years later this mode of treatment was carried out by several surgeons in Europe and this country.

Robert F. Weir,[3] of New York, was among the first who operated in this country. His latest report of a successful operation of this kind deserves the highest commendation. We deem it of great value to report this case in Dr. Foote's own words.

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[1] Barling: Birmingham Medical Review, August, 1895.

[2] Dobson: Bristol Medical and Surgical Journal, 1893, p. 196.

[3] Robert F. Weir and E. M. Foote: "The Surgical Treatment of Round Ulcer of the Stomach and its Sequelæ, with an Account of a Case Successfully Treated by Laparotomy." Medical News, April 25th and May 2d, 1896.

"Mary B—— consulted me in August, 1894, for an obstinate cough, with scanty expectoration and pain in the sternal and right scapular region, with dyspnœa on exertion, headache, anorexia, and constipation. She had twice spit up a small amount of blood. For four months she had had night sweats. The patient was at that time 15 years old, heavy but anæmic. Physical examination showed dulness and fine moist râles at the left apex, and right base behind, and she had an afternoon fever. Under tonic and expectorant remedies, and a month's residence in the mountains of Sullivan County, N. Y., she gained weight and the râles disappeared, except at the base of the right lung. The following winter she neglected herself, and, when I next saw her in April, 1895, her cough was worse, and she had moist râles over the greater part of both lungs, and she had lost six pounds in weight. Though living in poverty, she was able, through friends, to spend three months of the summer in the mountains, and she did not return to the city until the last of September, 1895, when she took a position as maid in an apartment, where the work was light and her food good. Her health was excellent, the cough and râles had disappeared, and her weight, one hundred and ten and a half pounds, was greater than it had ever before been. I was never able to secure any sputum for examination, but the signs of pulmonary tuberculosis had been too well marked to be doubted.

"She had frequently been troubled with indigestion, and at various times had vomited her food, but these symptoms had not been the prominent ones. About November 20th, 1895. she began to have severe gastric pain, and her appetite failed her. She spoke to no one about it and kept on with her work, though eating almost nothing. The pain, too, was at times so severe that she was compelled to lie down. On November 27th, at 10 A.M., she was attacked with a colicky pain in the gastric region so severe that she rolled upon the floor in agony, and vomited a small amount of coffee, which was the only nourishment she had taken that day. About noon she felt a little relief and went home by way of the elevated road. To do this, she walked about a quarter of a mile, and climbed up and down some fifty steps. Late in the afternoon she sent word to me that she had an 'attack of pain in the heart.' At 6:30 P.M. I found her lying on her back, quiet, and without much pain. Pulse, 120; temperature, 102°. The facies, though not well marked, was of a purely abdominal type. The chest revealed nothing abnormal. The abdomen was somewhat rigid, and more so on the left side than on the right. There was moderate tenderness on pressure in the epigastric and left iliac regions. There was no distention or tympanites. Respiration was almost wholly thoracic. Palpation revealed nothing but the seat of tenderness. The pain was described as commencing to the left of the median line under the costal border, and extending thence to the left groin and into the left thigh. Appendicitis was out of the question, and the symptoms did not appear to be those of any form of intestinal obstruction. The diagnosis of perforated gastric ulcer was made, and an immediate operation advised. Dr. Weir kindly consented to admit the patient to his service at the New York Hospital, where he performed laparotomy, and sutured the stomach at 9:30 P.M., a little over eleven hours after the onset of the attack.

"Under chloroform, a median incision four and one-half inches long was made above the umbilicus. An unusual amount of subperitoneal fat obscured the peritoneum. When its cavity was opened the stomach presented in the wound. The greater curvature appeared normal. There was no general peritonitis. The anterior surface of the stomach was adherent to the liver by recent lymph. As it was separated, a hissing sound was heard, due to the escape of gas from the stomach through the perforation.

"The opening was found without difficulty. It was minute, less than one-fourth inch in diameter, with necrotic edges, and lying in the centre of a dense ring of inflammatory and fibrinous tissue, which involved the whole thickness of the wall of the stomach. This thickened area was about two inches long and one inch wide, and was situated in the anterior wall of the stomach, about midway between the greater and lesser curvatures, and perhaps one-third of the distance from the pyloric to the cardiac orifice.

"The operation lasted about one hour, and the patient left the table in fair condition, with a pulse of 150. For two days there was frequent and very distressing vomiting, temporarily relieved by gentle lavage with diluted Thiersch's solution. After the second day the vomiting subsided, and water was allowed by the mouth. Fluid nourishment was given on the third day, and the nutrient and stimulant enemata, which had been given every six hours following the operation, were stopped in four days. There were at no time any signs of general peritonitis. Recovery was otherwise uneventful."

In his exhaustive paper, Weir gives a table, containing seventy-two cases of laparotomy for acute perforation of gastric ulcer. Among the names of operators in America we notice F. Markoe, Robert F.

Weir, C. P. Parker, McCosh, Kirkpatrick, Armstrong, and Stimson.

With regard to the results of operative treatment Weir furnishes the following table, which clearly illustrates the importance of early surgical interference:

Elapsed time.	Recovery.	Death.	Mortality per cent.
Under twelve hours..........	14	9	39
Twelve to twenty-four hours.	4	13	76
Over twenty-four hours......	4	28	87
Not stated..................	1	5	..
Total....................	23	55	71

The operations above mentioned for the treatment of a perforating gastric ulcer will also prove applicable for a perforating ulcer of the duodenum. A successful case of operation in the latter instance has recently been reported by A. Landerer and G. Glücksmann.[1]

Surgical procedures have also lately been advised for the treatment of very obstinate cases of gastric ulcer, consisting in excision of the latter or in the establishment of a gastro-enterostomy. Severe, persistent pains due to the formation of adhesions as sequelæ of gastric ulcer have also been relieved surgically by separating them (Lauenstein).[2]

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[1] A. Landerer und G. Glücksmann: "Mittheilungen aus den Grenzgebieten der Medizin und Chirurgie," Bd. i., p. 168. Jena, 1896.

[2] Lauenstein: Arch. f. klin. Chirurgie, vol. xlv.

CHAPTER VII.

ORGANIC DISEASES WITH CONSTANT LESIONS.—*Continued.*

Erosions of the Stomach.

Definition.—A condition in which the gastric mucous membrane becomes the seat of small superficial exfoliations.

General Remarks.—As is well known, the term "erosion" signifies a defect of superficial nature. In the stomach erosions are often found at the autopsy. Of late several valuable papers on the pathological anatomy of this subject and on the rare occurrence of erosions associated with typical ulcers of the stomach have been published.

In his excellent article, "Ueber geschwürige Processe im Magen," D. Gerhardt[1] describes erosions of the stomach in the following words: "Sections made of erosions as a rule show that at the base of the ulcerations almost the entire lower half of the mucous membrane is still preserved. In the epithelium of these remaining glands nothing remarkable can be discovered; at the sides the glands become longer; the first ones that are intact usually curve themselves over the defect and partly cover it. The recovery seems to take place by the simple after-growth of the gland remnants."

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[1] D. Gerhardt: Virchow's Archiv, Bd. 127, p. 85.

While the subject in question has been thoroughly discussed and studied in respect to the pathological anatomy by Gerhardt, Virchow,[1] Langerhans,[2] Harttung,[3] and Ewald,[4] very little has been done clinically. Although erosions of the mucous membrane of the stomach are mentioned in some text-books, there is nowhere defined how these conditions may be recognized during life.

In the *Medical Record* of June 23d, 1894, I have published an article which embodied observations on seven patients in whom small particles of gastric mucous membrane were frequently found in the wash-water of the stomach. These cases resembled each other in so many respects that they appeared as if belonging to one disease. They could best be considered as erosions of the gastric mucous membrane.

The description of "erosions of the stomach" which I shall give in the following is based on the paper just mentioned.

Etiology.—In the vast majority of cases chronic gastric catarrh is probably the cause of the origin of the erosions. In some instances the erosions may, however, be due to some factors yet unknown.

Symptomatology.—The subjective symptoms are especially pronounced and consist of pain, emaciation, and a feeling of weakness.

The *pains*, which are not usually intense, occur immediately after meals, independent of the character of the food of which the patient has partaken. They persist for a variable period of time (one to two hours) and disappear gradually. We have never observed cases characterized by severe attacks of pain. Intervals of complete freedom from pain of variable duration occur, during which the patient is perfectly well. In rare instances the pains are constant and independent of the ingestion of food.

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[1] R. Virchow: Virchow's Archiv, Bd. 5, p. 363.
[2] B. Langerhans: Virchow's Archiv, Bd. 124, p. 373.
[3] O. Harttung: Deutsche med. Wochenschr., 1890, No. 38, p. 847.
[4] C. A. Ewald: "Diseases of the Stomach," p. 236, 1892.

Emaciation.—Most cases lose in flesh during the first period of their sickness, but thereafter keep up their weight quite constantly. They look rather thin in the face (the jaws protrude, the cheeks are thin and somewhat hollow), but do not present that cachectic color we are accustomed to meet in carcinoma and other grave chronic troubles.

Feeling of Weakness.—All patients complain of a feeling of lassitude, weakness, lack of ambition, and inability to work, and of a decrease of bodily strength. These symptoms appear most markedly right after meals, and decrease somewhat a little while afterward (one-half to one hour). In one of my patients (G. B——) there usually appeared, once in a week or in a fortnight, an exacerbation of these symptoms associated with complete anorexia, which lasted for about two days. During this period of deterioration the patient was hardly able to walk.

Objectively the following point is of the greatest importance: in washing the stomach, when the patient is in the fasting condition, one to four small pieces of gastric mucous membrane are found. They are about 0.3 to 0.4 cm. long and nearly as wide, and present a blood-red color. Under the microscope one sees well-preserved glands and accumulations of red blood corpuscles (see Fig. 39). These pieces of gastric mucosa are constantly found if the stomach of the patient is washed out in the fasting condition. We have not to deal here with an incidental lesion caused by the tube, for while, on the one hand, this sign is present even if the lavage is performed without any aspiration and by means of a soft tube, on the other hand, one could not observe in a casual lesion that constancy which is found here.

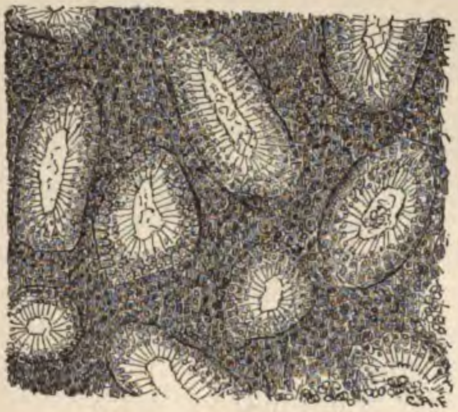

FIG. 44.—A Piece of Gastric Mucosa (patient M. G.), showing the glands mostly vertically cut, and accumulations of red blood corpuscles on the lower right-hand corner.

In most cases blood is never found in the wash-water carrying the small pieces of mucous membrane. Only rarely has the wash-water a very faint red color; this occurs especially if coughing spells frequently appear during lavage. Besides containing the pieces of gastric mucosa, the water is then stained slightly red.

The pieces of gastric mucosa which are found in the wash-water of these patients probably partly or wholly peel off from the mucous membrane of the stomach some time previous to the washing. This would explain why there is no bleeding during the lavage. The spots on which the exfoliations take place and which thus present "erosions," may explain the soreness met with in these patients. One can also easily understand the appearance of blood from the sore spots caused by violent contractions of the stomach during a coughing spell.

It is very difficult at present to decide whether the exfoliations always take place at the same spots—the mucous membrane constantly becoming replaced and peeling off—or whether the whole (or a great part) of the inner surface of the stomach is affected to such an extent that small pieces of mucosa easily peel off here and there. This question can only be answered after a long study of vast clinical and pathologico-anatomical material. These exfoliations take place (whether always on the same or on different spots) day by day in the stomach of our patients, and effect temporary erosions.

Condition of the Gastric Juice.—In most cases one encounters a decrease in the HCl secretion and in the acidity of the stomach contents. In some there is always found a considerable amount of mucus. Occasionally, however, there is found superacidity caused by an increased HCl secretion.

Course.—The course of this pathological condition is a very prolonged one. Several of the patients appear to suffer from it for many years. Although there may be intervals of perfect euphoria (at the same time probably the inner layer of the stomach is completely intact) for a longer or shorter period of time, the old symptoms do, however, sooner or later return.

One would imagine that cases of erosions of the stomach would present a very fruitful soil for the development of ulcers. This, however, does not seem to be the case, for in none of the patients was there any justifiable supposition of an existing ulcer during the long course of the sickness.

As typical cases of this affection we mention the two following cases:

CASE I. — February 11th, 1893.—H. S——, aged 35, merchant, suffers for two to three years from digestive troubles. These consist principally in the appearance of pains right after meals; the pains are not severe; they produce, however, the effect that patient eats less. There is a feeling of fulness; bowels constipated. Patient always feels weak and tired.

The examination reveals: chest organs intact; the gastric region is sensitive to pressure; there is splashing sound extending two fingers' width below the navel; right kidney movable.

The examination of the stomach contents one hour after Ewald's test breakfast showed: HCl +; acidity = 60.

February 13th. — When fasting, stomach empty. Lavage: in the wash-water three small red pieces of mucous membrane are found. Spray with silver nitrate.

February 14th.—Intragastric galvanization.

February 15th.—Lavage: in the wash-water three small red pieces of mucous membrane appear. A fresh microscopic specimen shows gastric glands. Spray with silver nitrate.

February 16th.—Patient feels better—*i.e.*, he is stronger, can eat more, and is not troubled with pains. Direct galvanization of the stomach.

February 17th. — Lavage: no pieces of mucous membrane are found. Spray with silver nitrate.

February 18th.—Intragastric galvanization.

February 19th. — Lavage: no pieces of mucous membrane. Spray with silver nitrate.

February 20th.—Intragastric galvanization.

February 21st.—Examination of the stomach contents one hour after the test breakfast: HCl +; acidity = 54; no pieces of mucous membrane.

February 22d.—Direct galvanization of the stomach.

February 23d.—Lavage: no pieces of mucous membrane. Spray with silver nitrate.

February 24th.—Intragastric galvanization. Patient had to return to his native city, Chicago, on account of urgent business. As I have recently heard, patient felt well all the time with but few intervals.

CASE II.—April 19th, 1893. — B. M. S——, aged 26, merchant, complains for two and a half years of digestive troubles. At first patient had lack of appetite, pains after meals, and nausea, but no vomiting. Feeling of weariness and fatigue; constipation. After some continued treatment and a trip to the South the condition of the patient improved for a while; soon, however, it got worse again. During the last two years patient has constantly pains right after meals, with but very few exceptions, and feels very weak. When fasting, patient as a rule feels well.

Status præsens.—Chest organs intact; the gastric region is sensitive to pressure. After drinking half a glassful of water a splashing sound can be produced, extending to one to two fingers' width above the navel. Liver not enlarged. Urine contains neither sugar nor albumin.

April 20th.—Examination of the stomach contents one hour after Ewald's test breakfast shows: HCl +; acidity = 60; admixture of much mucus.

Diagnosis.—Gastritis glandularis chronica mucosa.

April 21st.—When fasting, stomach empty. Lavage: in the wash-water, three red pieces of gastric mucous membrane. (A fresh specimen in glycerin shows gastric glands.) Spray with silver nitrate.

April 23d.—Intragastric galvanization.

April 25th.—Lavage: three red pieces of mucous membrane appear in the wash-water. Spray with silver nitrate.

April 27th and 29th.—Direct galvanization of the stomach. Patient had to leave New York on account of business and returned on May 17th.

May 18th.—When fasting, stomach empty. Lavage: three red pieces of mucous membrane are found in the wash-water. Spray with silver nitrate.

May 20th.—Intragastric galvanization.

May 22d.—Lavage: two red pieces of mucous membrane are found. Spray with silver nitrate.

May 24th.—Patient feels better, has a better appetite, and hardly any pain. Lavage: no pieces of mucous membrane are found. Spray with silver nitrate.

May 26th.—Direct galvanization of the stomach.

May 30th.—Lavage: no pieces of mucous membrane. Spray with silver nitrate.

June 2d. — Intragastric galvanization. Patient feels well and is, therefore, for the present dismissed.

Diagnosis.—The diagnosis of erosions of the stomach is made if the above-described subjective symptoms exist and particles of gastric mucosa are frequently found in the wash-water when applying lavage in the fasting condition of the patient.

Treatment.—The local treatment of the stomach here plays a great rôle. The astringent effect of nitrate of silver solutions in similar more accessible affections led me to apply this substance directly to the interior of the stomach. This can best be achieved by means of the spray. It was on this occasion that I constructed the gastric spray apparatus (see Fig. 36, p. 135), and recommended its use in the field of diseases of the stomach.[1]

In fact, the good result of this method of treatment can frequently be best shown in the affection in question, for after the spraying has been done several times the small pieces of gastric mucosa cease to appear. Associated with the objective symptom there appears an amelioration in the subjective feeling of the patient; the pains grow considerably less or entirely disappear, and the strength increases.

The treatment is given in the following way: First, the stomach in a fasting condition is washed out with lukewarm water; when all the water has been emptied, the tube is removed from the stomach. The spray apparatus is filled with 10 c.c. of a 0.1 to 0.2 per cent solution of nitrate of silver, the tube end dipped into warm water and inserted into the stomach (length of tubing 50 cm.); thereupon the whole, or at least the greater part, of the solution in the bottle is sprayed; the bottle is then opened and the spray tube removed from the stomach.

I usually combine the nitrate-of-silver spray treatment with intragastric galvanization, alternately applying the spray or the galvanization. The reason for the use of galvanization in these cases lies in the fact that I had such effective results in two other cases of probable erosions of the stomach, complicated with heart trouble,[1] by means of galvanization alone. The methodical application of intragastric galvanization combined with the spray seems to increase the curative effect.

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[1] M. Einhorn: New York Medical Journal, September, 1892.

As to diet, there is no need for being very rigorous in these cases. Frequent meals, avoiding heavy vegetables, salads, and pastries, is all I ordinarily require.

Cold ablutions, light gymnastics, outdoor life are to be warmly recommended.

Of medicaments condurango and nux vomica are frequently, and a good, easily assimilated iron preparation is always, appropriate.

Although these medicaments may be of value as adjuvants, we should rely, in my opinion, mainly upon the local treatment.

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[1] Max Einhorn: New York Medical Journal, July 8th, 1893.

CHAPTER VIII.

ORGANIC DISEASES WITH CONSTANT LESIONS.—*Continued.*

Cancer of the Stomach (Carcinoma Ventriculi).

Definition.—Malignant epithelial growth within the stomach.

Etiology.—The stomach is more frequently affected with cancer than any other organ of the body. Virchow's[1] statistics of all the cancerous diseases which occurred in Würzburg between 1852 and 1855 give for the stomach the proportion of 34.9 per cent. According to Lebert,[2] Willigk,[3] and Brinton,[4] cancer of the stomach comprises about one-fourth of all cases of cancer. Haeberlin[5] found the percentage of cancer of the stomach for the years from 1877 to 1886 to be 41. According to Wyss,[6] the death-rate from this disease is 1.9 per cent. This figure, however, is liable to many fluctuations. Haeberlin first pointed out the very curious and discouraging fact that the frequency of gastric cancer is steadily increasing. This writer's statistics for Switzerland show a death-rate from cancer of the stomach for 1,000 inhabitants in the years: 1877, 0.61; 1878, 0.66; 1879, 0.72; 1880, 0.77; 1881, 0.85; 1882, 0.87; 1883, 0.85; 1884, 0.84; 1885, 0.90; 1886, 0.99.

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[1] Virchow: Cited from Debove et Rémond, *l. c.*, p. 297.

[2] Lebert: "Traité pratique des maladies cancéreuses," Paris, 1851, p. 97.

[3] Willigk: Prager Vierteljahresschrift, vol. x., 2, 1853.

[4] W. Brinton: British and Foreign Medico-Chirurg. Review, January, 1857.

[5] Haeberlin: Deutsch. Arch. f. klin. Medicin, 1889, Heft 3 und 4, p. 461.

[6] Wyss: Blätter f. Gesundheitspflege, Zürich, 1872–74.

Joseph D. Bryant,[1] of New York, has also lately shown that cancerous disease is constantly on the increase. According to this eminent writer, the average death-rate from cancer in New York City during the last ten years is 2.17 per cent of the total mortality, but that of the preceding ten years only 1.82 per cent. The following table, given by Dr. Bryant, is very instructive as bearing on the increase of cancer in the United States:

Year.	Population.	Total deaths.	Deaths from cancer.	Cancer deaths per 100,000 from all causes.	Cancer deaths per 100,000 living.
1850	23,191,876	323,023	2,088	646	9.0
1860	31,443,321	394,153	3,672	932	11.7
1870	38,558,371	492,263	6,224	1,264	16.0
1880	50,155,783	756,893	13,068	1,815	26.05
1890	62,622,250	875,521	20,984	....	33.5

The frequency of gastric cancer appears to be different in different countries, and it seems that there are some regions in which it very seldom occurs. Haeberlin's above-mentioned statistics for the whole of Switzerland show a death-rate from cancer of the stomach of 3 per cent for the northern cantons, 1.5 per cent for the western cantons, and 1 per cent for the southern cantons. Griesinger[2] states that he

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Joseph D. Bryant: The Wesley M. Carpenter Lecture. New Medical Journal, May 18th, 1895.

riesinger: Arch. f. phys. Heilkunde, 1854, p. 528.

never observed cancer of the stomach in Egypt, and Heinemann[1] reports that he saw only one case in Vera Cruz in a period of six years.

Age.—As regards the age at which gastric cancer occurs, Brinton collected 600 cases, the ages of which at death averaged 50 years. The greater part (three-quarters, or 435) of these 600 cases fell in the epoch of life between 40 and 70. Arranged in decades of years, the maximum number (two-sevenths, or 162) occurred between 50 and 60. Comparing these numbers with the number of persons living in these decades of life, an estimate of the relative liability of the corresponding ages to the malady is obtained. Brinton gives the maximum liability between 60 and 70. Up to the age of 20, the whole risk is less than one-fiftieth of what it reaches between 20 and 30. The latter liability is multiplied in the following decades of years by 3, 6, 8, and 10 respectively. The maximum then seems to sink to little more than half for the next two decades, ending at the extreme age of 100. With reference to age, Lebert gives the following figures in his statistics: Under 30 years, 1 per cent; 30 to 40 years, 17.6 per cent; 40 to 60, 60.7 per cent; 60 to 70, 16.3 per cent; above 70, 4.4 per cent. Welch's statistics of 2,075 cases of gastric cancer show the following distribution for the different ages: 10 to 20, 2; 20 to 30, 55; 30 to 40, 271; 40 to 50, 499; 50 to 60, 620; 60 to 70, 428; 70 to 80, 140.

According to all these statistics, the maximum liability of gastric cancer lies between the fortieth and sixtieth year. It is very rare before the thirtieth year. Both Wilkinson and Wiederhoefer,[1] however, each mention a case in which the disease was congenital. M. Mathieu[2] has collected all the cases of gastric cancer below the thirtieth year mentioned in literature, and the number was 27. Debove[3] recently published a case of gastric cancer in a young man of 24 years, and I observed a similar case in a man of 27 years two years ago. In this latter case the disease was verified by an operation.

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[1] Heinemann: Virch. Arch., vol. 58, p. 180.

Sex.—The influence of sex is far more difficult to estimate than that of age. Brinton mentions 784 cases, of which 440 were males and 344 females. Fox's[4] tabulation of the statements of seven writers shows that of 1,303 cases 680 were males and 623 females. Of Welch's 2,214 cases, 1,233 were men and 981 women.

These figures show a higher percentage for men than women, but this statement is not of necessity absolutely true, for the larger percentage of cancer among men may result from the larger number of male patients treated in the hospitals from which these statistics have been obtained.

Heredity.—Most writers concur that in some families several members are found to be afflicted with cancer, and are inclined to attribute this fact to heredity. Every physician has observed cases in which the father and one or two sons had been troubled with cancer. In some instances there is a history of cancer in the parents, relating perhaps to some organ other than the stomach. Cancer being such a frequent malady, however, it is quite difficult to state whether these occasionally observed facts are sufficient to prove that heredity plays an important part, or whether it is a mere coincidence. Statistical figures on this point are given by Lebert and Haeberlin. The former found an hereditary history in 7, the latter in 8 per cent. Snow found among 1,075 cases of cancer in different parts of the body, 176 cases, or 15.7 per cent, in which cancerous disease had existed in the family.

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[1] Cited from Eichhorst: "Lehrbuch der spec. Path. und Therapie."

[2] Max Mathieu: Gaz. des Hôpit., 1884, p. 118.

[3] Debove: Société méd. des hôpit., November, 1889.

[4] Fox: "The Diseases of the Stomach," London, 1872, p. 184.

Cause.—Many factors have been regarded as playing an important part in the origin of cancer. Thus a trauma in the gastric region has frequently been held responsible for a cancerous affection. There is no doubt but that cases occur in which a few weeks previous to the discovery of a tumor in the abdomen a trauma in the affected region had taken place. But it would certainly be wrong in all these cases to attribute the neoplasm to the preceding trauma; for there are certainly some cases in which the neoplasm already existed before the trauma occurred, and in which the latter merely caused the patient to pay more attention to the injured region, and in this way led to an earlier recognition of the tumor. The frequent use of cider and of sour wines is said (Eichhorst and Cloquet) to favor the formation of a cancer. Mental worry and sad emotions have, probably wrongly, been regarded as playing a part in the causation of this affection.

Brinton suggested the following explanation for cancer of the cardia and pylorus: The muscular fibres of these two orifices are subjected to more work (contraction) than the rest of the stomach. The connective tissue enclosed in them is subject to contraction and distention. All this causes a more vivid nutrition of these parts, and may give rise to proliferation of the glandular tissue, forming a neoplasm.

Inflammatory conditions of the gastric mucous membrane have frequently been described as a predisposing factor of the disease. Menétrier[1] tried to show the connection between some forms of chronic gastritis (polypi) and the cancer. I must, however, agree with Ewald and Rosenheim that there is no reason to believe that a chronic gastritis favors the development of cancer, for in most instances we can state that the cancerous trouble developed more or less suddenly without any preceding history of a long-standing dyspeptic trouble. The gastritis found at the autopsy in cases of gastric cancer is rather a secondary or accompanying condition than a primary factor in the disease. Chronic gastric ulcers undoubtedly belong to the predisposing factors. Several cases have been described in which the formation of a cancer on the border of a gastric ulcer or its scar could be clearly seen. Thus Hauser[2] has histologically demonstrated the transition of ulceration into carcinomatous proliferation, and asserts that in one of the cases examined by him he found not only the secondary development of carcinoma in a gastric ulcer of very long standing, but that occasionally a cancer may develop from an affection of the gastric glands.

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[1] Menétrier: Arch. de physiolog., 15 févr., 1888.

[2] Hauser: "Das chronische Magengeschwür und dessen Beziehung zur Entwickelung des Magencarcinoms," Leipzig, 1883.

Parasitic Theory.—All the etiological factors mentioned may perhaps give us a better understanding of the development of the carcinoma, but do not by any means explain the ultimate cause of this malignant affection. Of late the parasitic theory of infectious diseases has furthered the belief that in cancer also we may have to deal with some micro-organism. Many recent investigators have made numerous studies and experiments in order to elucidate this matter. Scheuerlen[1] believed he had discovered a bacillus, to which he ascribed the origin of cancer. Later researches, however, have demonstrated that his assertions were wrong. Coley,[2] of New York, and Emmerich,[3] of Munich, have seen good results in the treatment of sarcoma, and also carcinoma, from the use of injections of the blood serum of horses which had been treated by the erysipelas cocci. This fact speaks in favor of a parasitic origin of this malignant growth. Psorosperms have frequently been found within the cancer cells. It is, however, not as yet determined whether these bodies are real psorosperms, or dried-up and changed cells. Hence we must confess that, notwithstanding the many researches into the pathology of cancer, we are as yet totally ignorant of its origin.

Morbid Anatomy.—It was first established by the researches of Waldeyer[4] that the cancerous process originates from the glandular elements of the mucous

[1] Scheuerlen: "Verhandl. des Ver. f. innere Medicin." Deutsche med. Wochenschr., 1887, No. 48.

[2] Coley: American Journal of the Medical Sciences, 1894.

[3] Emmerich: Deutsche med. Wochenschrift, 1895.

[4] Waldeyer: Virch. Arch., Bd. lv., p. 54.

membrane, its character being chiefly an atypical proliferation of the gastric follicles. Hence the origin of the neoplasm is in the mucosa, whence it penetrates the submucosa, forming here a more or less large deposit. Frequently the larger part of the growth is situated beneath the mucosa. After a while this malignant infiltration may attack the muscularis, and thereafter extend to the serosa. The spread of the infiltration, as a rule, takes place along the connective-tissue fibres. The neoplasm, after having reached a certain degree of development, may partly slough, thereby giving rise to irregular, ulcerated spots. This occurrence is most frequent in certain forms of cancer.

Cancer of the stomach, like that of other organs, may present the following varieties:

1. *Epithelioma.* The adeno-carcinoma or epithelioma forms soft tumors, presenting quite marked nodules and sloughing very slowly. It consists of pseudoglandular tubuli, surrounded by connective tissue and infiltrated with white blood corpuscles. These nodules show no regularity and have no outlets.

In the early stage the cylindrical epithelium is distinguishable, but as the growth gets older the regular arrangement of the epithelium is lost and the tubular spaces become filled with cells, the product of the multiplication of the epithelial cells. The latter undergo various forms of degeneration, and may form small cysts containing granular material and liquid.

2. *Medullary carcinoma.* The medullary carcinoma is characterized by large, flat, soft, fungating masses, projecting above the mucous membrane. The

pigment, it is called "melanotic"), and ver
generates, forming ulcerous spots on th
Secondary metastases are very frequent com

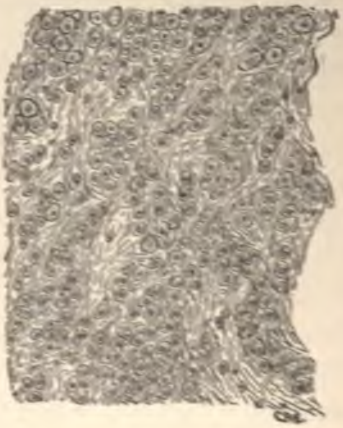

FIG. 45.—Section of Carcinoma Ventriculi (Mrs. J.), scirrhus for

3. *Scirrhus* (carcinoma simplex or fibrosu
scirrhus is characterized by the abundance o
tive tissue. The stroma is encircled by dens
tive-tissue fibres, and contains

stages, but when older it is frequently found superficially ulcerated. There is but little tendency to secondary metastasis.

4. *Colloid carcinoma.* The cells of the alveoli of the first-described two forms of cancer may undergo a colloid or mucous degeneration. The whole growth then assumes a gelatinous appearance. Thus arises the colloid carcinoma. Its appearance is very characteristic: the stroma of the tumor surrounds transparent, gelatinous-looking masses, which consist of the cancer cells in a condition of colloid degeneration. On cutting and scraping, a true cancer juice does not exude, but, instead, gelatinous fragments.

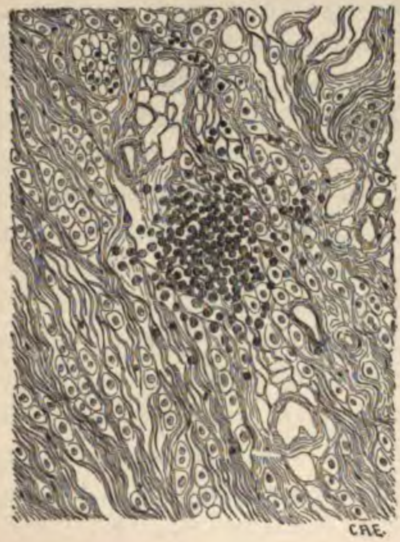

FIG. 46.—Cross-Section of Carcinoma Ventriculi (S.), showing cancer cells infiltrating the connective tissue. Small area of inflammation in centre. × 140.

The above-described forms of cancer are not always typically characterized, but different forms may sometimes be found in one and the same growth. At times, again, the form of the growth changes from one to the other of the just-named varieties of cancer. The scirrhus is by far the most common. Out of 180 cases of cancer Brinton found 130 belonging to this variety (72 per cent); 32 were medullary cancer, 14 colloid, 3 melanotic, and 1 epithelioma.

Topographical Relations of Cancer of the Stomach.—Size.—As regards size, two varieties of tumors may be distinguished. One is characterized by growing very little above the surface and involving large areas of mucous membrane. The other extends only over a small portion of the mucosa, and may develop extensively in thickness. The first form of tumors belongs to the medullary or colloid type, and is not met with very frequently. These growths present a flattened surface, covered with rough, nodular masses. Blood extravasations and adhesions to the neighboring organs are of frequent occurrence. The second form belongs to the scirrhus variety. The tumor involves a small circumscribed portion of the stomach, and tends to grow in depth and height.

Localization.—The development of cancer within the stomach may take place at various situations, at its orifices (cardia or pylorus), or within the organ itself. The recognition of the localization of the cancer is much more important than the distinction of the various forms, because each of the three different localizations of the cancer is accompanied by a characteristic train of symptoms, making its recognition possible during life, and requiring a special plan of treatment. As regards the frequency with which the different regions of the stomach are affected by cancer, Brinton found the following relation: Out of 360 cases the pylorus was affected in 219 instances, a proportion of exactly 60 per cent; 36 cases were cancer of the cardia, a proportion amounting to exactly 10 per cent; in the remaining 30 per cent the lesion was scattered over the greater and lesser curvatures. The fundus is attacked least frequently of all: among 1,300 cases of cancer of the stomach reported by Welch, only 19 were situated in the fundus. The figures given by Lebert,[1] Katzenellenbogen,[2] and other writers, agree very closely with Brinton's figures. It is easily seen that the localization of the cancer is very markedly different from that of ulcer, for in the latter affection the orifices of the stomach are the least frequently affected.

The Shape of the Stomach.—The different situations of the cancer influence the shape and the position of the stomach. The organ is found to be retracted and small in size in all cases of cancer of the œsophagus and cardia. The viscus is very much dilated in cases of cancer of the pylorus. The shape of the stomach may be distorted in case the tumor, situated near the pyloric orifice, descends by reason of its weight and drags the organ down into the pelvis. Distortions and contractions of the stomach may also be developed as a consequence of inflammatory adhesions with adjacent viscera.

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[1] Lebert: "Traité pratique des maladies cancéreuses," Paris,

bogen: "Beiträge zur Statistik des Magencarci-
Diss., Jena, 1878.

Gastric cancer is almost always primary, and secondary growths of the stomach must be considered as a great rarity. Cancer of the stomach may, however, coexist with a primary cancer of some other organ, as, for instance, the uterus and ovaries. Ewald mentions a case in which he found an immense cysto-sarcoma of the uterus and a carcinomatous infiltration of the pylorus.

Secondary Changes Accompanying Cancer of the Stomach.—Aside from the cancerous lesions, the affected area of the stomach is usually the seat of various anatomical changes. Thus thickening of the mucosa, caused by hypertrophy of the connective tissue and muscular fibres, is frequently observed. Ewald first observed that the whole mucosa may present characteristic lesions of chronic gastritis. At some places the glands have disappeared; at others they exhibit mucoid changes; while at still others cysts are found.

Cancerous Metastases.—Secondary cancerous deposits in other organs are of frequent occurrence in cancer of the stomach. Out of 437 cases Brinton saw this complaint in 210, or in 48 per cent. The medullary and colloid forms of cancer are more often associated with secondary cancer than is the scirrhous form. Among the organs in which the secondary cancerous deposits appear, the liver takes the first place. Brinton gives the figure of secondary deposits in the liver as 25 per cent of all cases of gastric cancer, while Lebert gives the figure of metastasis in the liver as 40.9 per cent of all the metastases. This writer gives the following figures for the metastases in other organs: peritoneum, 37.5 per cent; lungs, 8.3 per cent; ovaries, 4.5 per cent. In some cases, however, the secondary cancer of the liver is associated with deposits in the other organs; for instance, the peritoneum, pancreas, kidneys. The intestines and lungs may be affected at the same time. The metastatic infection usually takes place by way of the blood current or the lymph vessels. In some instances, however, a direct extension in continuity of the cancerous growth to a neighboring organ may take place. Thus the extension of a pyloric cancer to the liver or the gall bladder, or of a cancer situated at the greater curvature to the colon, or, again, of a cancer of the smaller curvature to the pylorus, is often observed.

The lymphatic glands are frequently found swollen, but in cancer of the stomach this symptom does not appear as often as in neoplasm in other organs. Brinton has observed this symptom in 23.5 per cent of these cases. The swelling of the glands is frequently caused by cancerous deposits in them; sometimes, however, they may be swollen simply in consequence of a condition of irritation.

The cancerous deposits may appear at one spot, forming a new tumor varying in size in the respective organs; sometimes, especially if the cancerous material has been carried through the lymphatics, numerous small deposits may exist, and the whole organ may then appear as if studded with mili- y tubercles. This condition is frequently found in pleura. It is at first quite difficult to decide at glance the real nature of this tubercle-like deposit. The microscope will quickly solve the problem. Koch's bacillus is found in the real tubercles, while the cancerous deposits contain no bacilli and will show the characteristic structure of the neoplasm. While the cancerous deposits may at times appear in this form, simulating a tuberculous affection, the latter condition may occur independently in cases of cancer of the stomach; that is to say, both affections, viz., cancer and tuberculosis, may coexist in the same person.

Symptomatology.—In a typical case the course of the disease is as follows: A person, usually of middle age, who has been previously in good health, experiences uncomfortable sensations after meals, impairment of appetite, more or less disturbance of sleep, and loss of strength. Although slight at first, these symptoms persist and remain obstinate to all methods of treatment. In the course of time they become more and more aggravated. Pains appear, which are always very annoying and sometimes show exacerbations of a very acute and intense form. While at first there is only belching and a mouthful of food is occasionally ejected, after a while vomiting appears and deprives the patient of the little nourishment he takes. Still later hemorrhages appear. Although the quantity of blood ejected is, as a rule, not large, this symptom, however, greatly debilitates the patient, as it usually occurs several times in succession. About the same time that the hemorrhage begins to appear, a tumor becomes perceptible in the gastric region. The patient now presents a cachectic appearance and falls off daily. He becomes extremely weak and prostrated, and usually death from inanition follows.

In analyzing the symptoms accompanying a neoplasm of the stomach, it is important to divide them into: *A*, Those caused by the growth itself (general symptoms); and *B*, those produced by the position of the growth—(*a*) cardia; (*b*) pylorus; (*c*) stomach proper.

A. General Symptoms.—These are partly subjective, partly objective, and may be enumerated as follows:

1. *Anorexia*, or loss of appetite, is a very frequent although not very characteristic symptom of gastric cancer. Numerically Brinton found it present in eighty-five per cent. The appearance of this symptom is sometimes delayed until a comparatively late period. Anorexia in this instance is not caused by any fear of pain the ingested food may invoke, but is attributable to a direct lesion of the nerve centre of hunger. There is a real loss of appetite, or no desire, no inclination to take food. In some instances there exists an actual aversion for food, especially with reference to all kinds of meat and food rich in albumin. Sometimes there is present in these cases a craving for highly seasoned articles, such as pickles, herring, and so on.

2. *Pain.*—Pain is the most constant of all symptoms. It is present, according to Brinton, in about ninety-two per cent, and according to Katzenellenbogen in a still larger percentage of cases. The situation of the pain does not always correspond to the site of the lesion. Thus a pyloric cancer may cause pains referable not only to the right hypochondrium,

but also to the sternum or the left hypochondrium. The pain most characteristic of this condition is usually of a lancinating character. It begins at a comparatively early date, and soon assumes a marked severity. Often it becomes so intense that all other symptoms are relegated to the background. It is characteristic of the pain of gastric cancer that it never entirely disappears. There may be remissions in the severity of the pain, but there are never really free periods. Unlike the pain of gastric ulcer, it is either little or not at all affected by the ingestion of food. Never is it relieved at the end of gastric digestion or after vomiting. The character of the pain is sometimes described by the patients as dull, gnawing, or burning; sometimes as being attended by a sense of weight, oppression, tightness, or distention in the epigastrium; sometimes, again, by soreness or tenderness to pressure in this region. Exacerbations of the pains are frequently caused by ulcerative processes taking place on the surface of the cancer; sometimes, again, by inflammatory adhesive processes with the neighboring organs.

3. *Vomiting.*—Vomiting is likewise one of the most frequent symptoms. Brinton found it present in eighty-seven and one-ninth per cent of his cases, and Arnold in eighty-six per cent. The frequency of this symptom is largely dependent upon the situation of the cancer, occurring much oftener in those cases in which the cancer occupies either the pylorus or the cardia. But it may exist even when the cancer has no connection whatever with the orifices of the stomach. The vomiting takes place either sometimes af-

ter the ingestion of food or independent of it. Thus some patients vomit in the morning when arising, and eject either a quantity of mucus or, more frequently, some undigested and decomposed food particles. The ejected matter often has an offensive smell, and as a rule contains numerous micro-organisms, sarcinæ, yeast cells, and sometimes changed blood.

4. *Hemorrhage.*—Vomiting of blood is observed, according to Brinton, in about forty-two per cent of the cases of gastric cancer. The blood is sometimes ejected in sufficiently large quantity to be recognized with the naked eye. More frequently, however, it is not vomited in the pure state, but mixed with gastric juice, food, mucus; sometimes the blood has undergone many changes during its sojourn in the stomach, and then looks blackish, brownish, or presents a coffee-ground appearance. The quantity of blood ejected is, as a rule, smaller in gastric cancer than in ulcer; but while in ulcer the hemorrhage if once entirely arrested very seldom recurs, it is quite different in cancer. For here small hemorrhages appear in succession for a long time, at intervals of a few days' duration. Melæna (blood in the stool) sometimes accompanies the hemorrhage. It is found, however, less frequently than in gastric ulcer. The hemorrhage, as a rule, takes its origin from the minute vessels of the submucous plexuses or from the capillaries of the superficial layer of the mucosa covering the neoplasm. It is very seldom that a larger vessel is opened, and in that case a fatal issue results. The hemorrhage is also caused by manifold processes of ulceration, involving the vessels of the cancerous mass.

5. *Tumor.*—The presence of a tumor in the gastric region is one of the most reliable and pathognomonic signs of cancer. The recognition of this will depend upon its size and position. The larger the tumor, the more superficially it is situated, the more easily can it be detected. Inspection alone sometimes suffices to make us suspect a malignant growth: on looking at the gastric region, either in the standing or recumbent position of the patient, a protrusion is noticed, either below the ensiform process or at the margin of the ribs on the right or left side. The result of inspection must always be corroborated by the palpation method. The latter is much more reliable and by far more effective. The palpating fingers encounter a resistant body of varied size and shape, often presenting the appearance of a hard, irregular, nodulated mass; sometimes, however, being smooth and small, and but slightly different from a contracted abdominal muscle. The latter cases are the most difficult to recognize, and sometimes a positive diagnosis as to the presence of a tumor can hardly be made. Percussion is another means of verifying the results of palpation. The presence of a tumor in the stomach will give a dull sound on gentle percussion, and sometimes a tympanitic note on firm percussion.

Whether the existing tumor belongs to the stomach or not, and also what region of the organ it occupies, can be determined by the following methods: A tumor of the lesser curvature moves slightly downward on deep inspiration, and becomes less distinct or sometimes disappears on deep expiration. On inflating the stomach with carbonic-acid gas or with air, the resistance will be found just above the gastric area. Tumors of the pylorus, if not adherent to the liver, will move down on inspiration, and if held in this position with the hand will not ascend during expiration; if adherent to the liver they will move up during the act of respiration. A tumor of the pylorus sometimes disappears when the stomach is full, on account of the different positions the stomach occupies in its empty and in its filled states. A tumor of the greater curvature will move up and down during inspiration and expiration, and will also descend when the stomach is inflated with air; it will then occupy the lowest border of the inflated area.

According to my experience, transillumination of the stomach gives the best results with regard to the recognition of the presence of tumors and the determination of their situation. The tumor, not being translucent, is visible as a dark spot within the red transilluminated zone of the abdominal wall. It appears on top of this zone when the tumor occupies the lesser curvature, and at the base of the transilluminated area when it springs from the greater curvature. The dark spot is at the right in tumors of the pylorus. In some instances transillumination discloses the presence of a tumor even when the latter is not yet accessible to palpation.

6. *Fever.*—The occurrence of fever in gastric cancer does not belong to the regular symptoms. It is, however, met with oftener than is generally believed. It usually appears in the latest stages of the disease, and is always a bad omen; for frequently the fatal issue is then impending. In rare instances the rise of

temperature occurs at certain periods of time, and presents a marked similarity to a fever of malarial origin. Hampeln[1] relates a case presenting this peculiarity. In most instances the fever does not show any regularity, is, as a rule, not very high, and accompanied by frequent intermissions. The fever is probably due either to an inflammatory process which occurs in the neighborhood of the neoplasm, or, more frequently, to the absorption of a toxic material from ulcerated areas of the tumor. The latter circumstance is also responsible for a comatose condition which is sometimes met in these cases, especially in the last stages of the disease.

7. *Constipation.*—More or less obstinate constipation exists in the majority of cases of gastric cancer. According to Ewald, the bowels remain regular in only four to five per cent of the cases. The constipation may at times alternate with diarrhœa; the latter is the result of a catarrhal condition of the intestinal mucous membrane, due to the irritation of hard scybala or to the products of decomposition. Frequently diarrhœa appears whenever sloughing of the neoplasm occurs. It often indicates imminent danger, and is not unfrequently the proximate cause of death.

8. *Cachexia.*—Cachexia is met with in almost all cases of gastric cancer after the disease has progressed long enough, and is, if present, an important symptom. Its absence, however, by no means militates against the existence of cancer. Brinton regarded cachexia as pathognomonic of cancer, being the re-

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[1] P. Hampeln: Zeitschr. f. klin. Med., Bd. 8, p. 232.

sult of a humoral disease. At present, however, most writers agree that the cachexia is brought about in most instances not by specific poisons circulating in the blood, but by subnutrition. From my own experience, I can state that I have frequently made the diagnosis of gastric cancer in people who presented a very healthy appearance, and who had not become emaciated. The diagnosis in some of these cases was later verified either by an operation or at the autopsy. In one case of cancer of the pylorus in a man, forty-two years of age, who had slightly lost in weight but who was yet well nourished, in the first few weeks of treatment an increase in weight of eight to ten pounds was effected. The same patient was operated upon some time afterward, the pylorus being resected, but he succumbed one year later.

9. *Œdema.*—In the first stages of cancer malleolar œdema sometimes appears for a short time. Boas[1] found this symptom in twelve per cent of his cases. This œdema fugax is, however, not a pathognomonic sign, as it may occur, according to Boas, in other affections of the stomach of a non-malignant type. Ascites or anasarca, or both, frequently appear in the last stages of the disease.

10. *Metastases.*—As mentioned above in speaking of pathology, metastatic tumors frequently occur. Thus enlarged glands of hard consistence and nodular character are suggestive of cancerous deposits. A nodular infiltration of the liver, presenting a hard and uneven surface, is very frequently met with in

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[1] Boas: "Spec. Diagnostik und Therapie der Magenkrankheiten," 2te Aufl., p. 185.

gastric cancer. A carcinomatous metastasis in the thorax is accompanied by the symptoms of pleurisy (dulness, pains, friction sound). Although these metastases, as a rule, appear quite late, still if present they may help to clear the diagnosis.

11. *Condition of the Blood.*—Laache[1] first described a decrease of the number of red blood cells in this affection, while Haeberlin[2] found that the hæmoglobin was greatly diminished. According to this writer, the quantity of the latter is only fifty per cent of the normal. Eisenlohr[3] and Schneider[4] found an increase of the leucocytes. While all these conditions are of some importance, as suggestive of cancer, they are by no means specific and are met with in other affections.

Recently Schneyer[5] has stated that the usual increase in the number of leucocytes, which is found normally during the period of gastric digestion, is absent in all cases of gastric cancer; that is, the number of leucocytes in the fasting condition and at the height of gastric digestion remains the same. This symptom promises to be of great value, and it should certainly be further investigated.

12. *Condition of the Urine.*—Klemperer[6] and Müller[7] discovered that the urine in cases of gastric cancer contains more nitrogen than the amount introduced with the nourishment. It has been found,

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[1] S. Laache: "Die Anämie," Christiania, 1883.

[2] Haeberlin: Münchener med. Wochenschrift, 1888, No. 22.

[3] Eisenlohr: Deutsch. Arch. f. klin. Med., Bd. 30, p. 495.

[4] G. Schneider: Inaugural Dissertation, Berlin, 1888.

[5] Schneyer: Zeitschr. f. klin. Med., 1895.

[6] G. Klemperer: Berl. klin. Wochenschr., 1889, No. 40.

[7] Fr. Müller: Zeitschr. f. klin. Med., Bd. 16, p. 496.

however, that this symptom is not constantly present. Besides, the elucidation of this fact necessitates quite complicated and laborious investigations, which can be made only in clinics, but not in private practice. The amount of chlorides is frequently found diminished, while the indigo-forming substances are often increased. Peptonuria is occasionally observed; it always indicates that there is absorption from an ulcerated area (neoplasm) within the digestive tract, and is therefore of importance.

B. Symptoms Produced by the Position of the Growth.—These may be divided into three groups, according to the location of the growth.

(*a*) *Cardia. Subjective Symptoms.*—Dysphagia is one of the principal symptoms of cancer of the cardia. The patient first notices that he cannot eat as fast as he would like. Frequently he has to stop in the middle of a meal, experiencing a sensation as if the food would not go down into the stomach. This occurs only if solid food is taken. The patient, as a rule, learns to help himself by drinking several mouthfuls of water when such an impediment occurs. Very soon these difficulties increase in severity and in number, and the patient can hardly partake of solid substances without drinking liquids with them. Still later, the patient finds it impossible to partake of solid food, as he cannot force it down into the stomach even by means of water. Whenever he tries to do so, the food remains within the œsophagus and causes a feeling of extreme discomfort and oppression. The patient is then usually obliged to eject it after much straining and retching. Liquid food is at this time the only diet on which the patient subsists. Still later, when the stenosis is of a very high degree, the patient is unable to partake even of a sufficient quantity of liquids, as he can force through the stenosed cardia only very small amounts or none at all. Besides these difficulties in eating and drinking, the patient often complains of either pains or a burning sensation at the scrobiculus and somewhat above it. "Vomiting," or, more correctly, ejection, of some mucus with or without food particles from the œsophagus often occurs, especially at night, in the recumbent position of the patient.

Objective Symptoms.—1. *Swallowing sound.* The swallowing sound, if not absent, is frequently retarded, and heard about twenty seconds after swallowing of water, while normally it should be heard after seven. This sign, however, is not pathognomonic; for, on the one hand, I have seen cancer of the cardia with the appearance of the swallowing sound at the normal time of seven seconds; and, on the other hand, I have observed a case in which there was no organic trouble and still the swallowing sound was not heard for a long time.

2. *Examinations with the tube.* It is best to examine the patient with silkworm tubes of different sizes. The examination should be directed with the following objects in view:

Permeability.—It is of the utmost importance to introduce the tube through the œsophagus into the stomach, and to pay attention to the fact whether there be no resistance at any place of the passage. If a resistance is felt, mark at what distance from the mouth it is situated, and also whether it can be overcome without the application of much force. Much force should never be exerted; if a tube of a certain thickness has met with resistance within the œsophagus, then try a tube of thinner calibre. In this way the degree of stenosis can be estimated.

Particles of Tumor.—When withdrawing the tube from the œsophagus, it is always necessary to close the opening with the thumb, and then empty the contents into a porcelain dish. Sometimes small particles of the neoplasm are then found, which, when examined under the microscope, will frequently reveal the nature of the trouble, and assist us in making a positive diagnosis of cancer.

Blood.—The tube sometimes contains either fresh clear blood, not smelling badly, or blackish-looking and decomposed blood mixed with mucus, with a very disagreeable, sometimes fetid odor. The latter condition is very frequently found in malignant strictures of the cardia, and is sometimes pathognomonic of cancer. Fresh, clear blood, appearing constantly at the examination of the tube, is suggestive of malignant trouble at the cardia, even when no stricture has yet been found. This symptom, however, is not a positive one, as there are other conditions that may produce it. The following case well illustrates the importance of the detection of blood at the lower end of the œsophagus:

Patient, about 45 years old, had complained of a burning sensation and pains in the epigastric region for over a year. He had no difficulty whatsoever in the partaking of food. He was not emaciated and presented a healthy, good color. On examination, the gastric region was found to be somewhat tender, but not painful to pressure. The outlines of the stomach were not enlarged. The swallowing sound was heard seven seconds after the deglutition of water. The examination with the tube one hour after test breakfast revealed no abnormal conditions whatever. The tube passed into the stomach without the slightest resistance. The chemical analysis of the gastric contents showed the presence of free hydrochloric acid, the absence of lactic acid, and a degree of acidity of 60. On washing out the stomach of the patient in the fasting condition, it was found that it contained no food from the previous day, and the water returned pretty clear. When, however, the water stopped running and the tube was partly withdrawn, so that its end was in the neighborhood of the cardia, a small quantity of clear blood, mixed with some water, usually ran out. When the upper opening of the tube was closed and the instrument entirely withdrawn, it was found to contain pretty clear blood. Numerous examinations during a period of about two months showed the presence of the same condition, especially with regard to the appearance of blood at the end of the washing procedure or when withdrawing the tube. The characteristic rest treatment for ulcer did not benefit the patient in the least. The probable diagnosis of cancer of the cardia was made, and the patient died one year afterward in a well-known sanitarium in Germany, in which the diagnosis of cancer had been confirmed.

3. *Retention of Food within the Œsophagus.*—In most instances of cardiac stenosis some of the food particles remain within the œsophagus above the ste-

nosed spot. As a rule, they become decomposed and cause an irritation or inflammation of the œsophageal walls. The retention of food within the œsophagus is an important sign, and can be discovered one hour after the partaking of a small meal, in the following way: A tube of ordinary size (not too narrow) is introduced into the œsophagus until about 1 or 2 cm. above the stenosed spot, and the patient ordered to compress his thorax after a deep inspiration. As a rule, some contents now appears through the tube. The opening is then closed, the tube withdrawn and emptied, and the obtained contents examined as to appearance (macroscopical aspect), reaction, whether acid or not, whether containing lactic acid, hydrochloric acid, or the ferments. A tube of thinner calibre which can pass the stricture is then taken, and introduced into the stomach.

By the ordinary expression method the real gastric contents are now obtained. Their macroscopical appearance, as well as their chemical condition—which again refers to acidity, presence of hydrochloric acids, and ferments—is compared with the portion first obtained by means of the thicker tube. In cases of actual retention of food within the œsophagus, the first portion shows the following characteristics: Reaction, either neutral, alkaline, or slightly acid; hydrochloric acid and ferments absent; organic acids occasionally present. The particles of food appear unchanged in any way and are in just the same condition as when swallowed. The second portion, obtained from the stomach, presents the appearance of chyme, shows a decided acid reaction, the presence of hydrochloric acid either in its free state or combined, frequently the presence of ferments, especially rennet, and gives the biuret reaction.

Retention of food within the œsophagus is not pathognomonic of cancer of the cardia, as it is also found in dilatation of the œsophagus, caused either by a benignant stricture of the cardia or by a disturbance of the peristaltic action of the œsophagus. The latter two conditions, however, are quite rare, so that the symptom of retention is of much importance in the diagnosis of cancer of the cardia.

4. The examination with the œsophagoscope often shows a neoplasm.

(*b*) *Pylorus. Subjective Signs.*—Besides the pains, there exist a decided feeling of fulness and quite frequent attacks of vomiting.

Objective Signs.—1. Tumor. A tumor can very frequently be discovered, situated somewhat to the right of the linea alba in the area extending from the navel to the ribs. The methods of diagnosing these pyloric neoplasms have already been described above. 2. Vomited matter. This consists of large quantities of chyme (one to two quarts or more), and, as a rule, contains food which had been taken a day or two before the act of vomiting. 3. Ischochymia. This condition (retention of chyme) is very pronounced. On examining the stomach in the fasting condition of the patient by means of the tube a considerable quantity of chyme, containing more or less decomposed food from previous days, is found. Very frequently the particles of food are quite coarse and obstruct the openings of the tube. In such instances it is often very difficult to empty the stomach entirely, even by means of washing. This object can hardly be achieved in one sitting.

(*c*) *Stomach Proper. Subjective Symptoms.*—1. Pains. A constant gnawing pain in the scrobiculus cordis radiating to the back is frequently found present. 2. Anorexia is very marked.

Objective Symptoms.—1. Tumor. The presence of a tumor situated to the left of the linea alba (see page 262). 2. Vomiting of small quantities of food, frequently presenting a blackish color. 3. Ischochymia of a slight degree. The examination by means of the tube of the stomach in the fasting condition reveals the presence of a small quantity of chyme, the particles of food therein being quite minute.

Diagnosis.—The diagnosis of cancer of the cardia is made from a study of the above-described symptoms and the results of the examination with the tube. Cancer of the pylorus and stomach proper is diagnosed in the same manner. Although the hope of finding certain pathognomonic characteristics in the chemical condition of the gastric contents with cancer of the stomach has not been realized, still the chemical analysis reveals several points which certainly aid in establishing the diagnosis of the affection in question. Van den Velden,[1] in 1879, first stated that hydrochloric acid is absent in gastric cancer. He made use of certain aniline dyes (Congo and methyl violet) for the detection of this acid. Cahn and von Mering[2] made use of an exact analytical method, and found that in some cases of gastric cancer the stomach contents revealed considerable quantities of hydrochloric acid. Ewald justly mentions in his book that the question as to the presence or absence of hydrochloric acid in gastric cancer had been experimentally broached as far back as 1842 by the English physician Golding Bird.[1] In a man forty-two years old, with pyloric cancer and dilatation, this writer determined the relation of hydrochloric and the organic acids in a series of examinations of the vomit. The results of these examinations led Bird to conclude that "during the most irritative stages of the disease free hydrochloric acid is present in the vomit in considerable quantities, but it gradually diminishes in proportion to the patient's loss of strength, and that the organic acids increase proportionally as the free hydrochloric acid diminishes."

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[1] Van den Velden: Arch. f. klin. Med., Bd. 22, p. 369.

[2] Cahn und von Mering: Berl. klin. Wochenschr., 1885.

In forty cases of gastric cancer Boas[2] found an absence of hydrochloric acid in thirty-five, while in the remaining five free hydrochloric acid was discovered. Among the cases of gastric cancer that I have seen during the last few years, I know of six in which free hydrochloric acid was present, either in normal or in greater quantities. These cases of gastric cancer in which hydrochloric acid is found to exist certainly lessen the value of Van den Velden's symptom for the recognition of the disease; but this symptom loses still more in importance if we consider that absence of free hydrochloric acid is associated with many other conditions besides cancer. Severe forms of gastric catarrh, and especially achylia gastrica, will undoubtedly furnish a greater contingent of cases with absence of hydrochloric acid than cancer of the stomach itself.

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[1] Golding Bird: "Contributions to the Chemical Pathology of some Forms of Morbid Indigestion." London Med. Gazette, 1842, p. 391.

[2] Boas: *l. c.*

Lactic Acid.—Although it was known that the organic acids are increased in cancer of the stomach, and that lactic acid frequently occurs, Boas [1] must be credited with laying stress upon the presence of lactic acid in this affection; he even attributed a pathognomonic value to this symptom. According to this investigator, lactic acid, if not introduced in a preformed state with the food, but developing in the stomach, occurs exclusively in cancer of this organ. After a thorough washing of the stomach, Boas gives the patient a test meal, consisting of a plate of barley soup. One hour afterward the gastric contents are obtained and examined, either by the Uffelmann test or by Boas' method, as to the presence of lactic acid. This test meal does not contain any lactic acid, and if the latter is found to be present then it must have been produced in the stomach. Boas does not deny that there are cancers of the stomach which do not show this symptom. As a rule, these are cases in which hydrochloric acid is found to be present. The occurrence of lactic acid, however, is, according to Boas, a specific sign. Many writers have of late investigated the question of the appearance of this acid. Most of them agree that lactic acid exists in large quantities in the majority of cases of gastric cancer, but that it is by no means a specific sign. Klemperer,[1] Thayer,[2] Rosenheim,[3] and myself,[4] have published cases of non-malignant gastric troubles in which lactic acid was found in the gastric contents.

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[1] J. Boas: Deutsche med. Wochenschr., 1892, No. 17.

The absence of free hydrochloric acid and the presence of lactic acid, although they are, as we have seen, not pathognomonic, are, however, of importance and frequently help to establish the correct diagnosis.

The diagnosis of cancer can be positively made under the following conditions:

1. If particles of tumor are found (in the wash-water or in the tube), which under the microscope reveal the characteristic picture of a malignant growth.
2. The presence of a more or less large tumor with an uneven surface, belonging to the stomach and associated with dyspeptic symptoms.
3. The presence of a tumor associated with frequent hæmatemesis.
4. Constant pains, frequent vomiting, ischochymia, emaciation—all these symptoms being quite permanent and not extending over too long a period of time (six months to one year).
5. Tumor and ischochymia.
6. Emaciation, ischochymia, presence of lactic acid.
7. Constant anorexia and pains, not yielding to treatment, accompanied by frequent small hemorrhages (of coffee-ground color).

Differential Diagnosis.—In cases in which a tumor exists it is necessary to determine whether it originates from the stomach or some other organ; and if it has its seat in the stomach, whether it is of benign or malignant character. The first question, as to which organ a tumor belongs to, has been discussed above. As regards the second question, we shall have to differentiate between a tumor situated within the stomach proper and one at the pylorus. Benign tumors, like fibroma, myoma, and lipoma[1] situated within the stomach, or foreign bodies, like a gastrolith or a mass of hair, which may simulate a neoplasm are of extremely rare occurrence and need hardly be taken into consideration when making the diagnosis. In tumors situated at the pylorus we meet much more frequently conditions of a benign type, such as cicatricial thickening or simple hypertrophy. The size of the tumor, the condition of its surface, whether smooth or nodular, will frequently help to decide this question. The tumor in benign processes is usually not very large (about walnut size), smooth, and does not grow; while malignant growths are larger, frequently present an uneven surface, and increase in size. These points are, however, not enough to form a decisive opinion, and they must be supplemented by such data as can be obtained. Thus, long duration of the sickness—two or three years and more—speaks in favor of a benign process, while a short duration—six months and so on—rather favors the view of a malignant process.

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[1] Klemperer: Deutsche med. Wochenschr., 1895.

[2] Thayer: Johns Hopkins Hosp. Bullet., 1893, No. 31.

[3] Rosenheim: Berl. klin. Wochenschr., 1894, No. 39.

[4] Max Einhorn: "Stenosis of the Pylorus." Medical Record, January 19th, 1895.

In all instances in which a tumor is absent the differential diagnosis of cancer will have to exclude ulcer, benign stenosis of the pylorus (not palpable), chronic gastric catarrh, achylia gastrica, and very severe forms of gastric neurasthenia.

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[1] Syphilitic gummatous tumors of the stomach also belong to this class. I have observed a case of this kind very recently. The presence of other luetic manifestations will remind us of this possibility.

1. *Ulcer.*—In ulcer there is, as a rule, clear tongue, a circumscribed spot painful to pressure, some connection of the pains with the period of gastric digestion, intervals perfectly free from pain, very large hemorrhages, not recurring very frequently, and, as a rule, no real anorexia. In cancer, on the other hand, the tongue is almost always thickly furred, the painful area generally extends over the greater part of the gastric region, the pains not having much relation with the digestive period, the hemorrhages are rather small and very often recurring, and real anorexia or aversion for food exists.

2. *The benign stenosis of the pylorus* gives a long history of sickness interrupted by intervals of almost perfect euphoria, extending over different periods of time (one year to two or three months); the gastric contents generally show the presence of free hydrochloric acid and an increased degree of acidity. Malignant stenosis of the pylorus gives a short clinical history, no intermissions, and the gastric contents most often do not contain free hydrochloric acid and reveal the presence of lactic acid in considerable quantities. The degree of acidity is variable, sometimes being greatly increased through organic acids.

3. *Chronic Gastric Catarrh.*—A severe form of chronic gastric catarrh may at the beginning give rise to considerable difficulty in establishing the diagnosis between the two conditions. Sometimes this will be

at first impossible. By keeping the patient under observation for a certain length of time the diagnosis will often clear up, the chronic catarrh will improve under rational treatment, while cancer of the stomach will either show no amelioration whatever or only a very slight one, the main symptoms of the disease continuing in the same way as before the institution of the treatment.

4. *Achylia Gastrica.*—In achylia gastrica the tongue is sometimes clear, the gastric contents showing no juice whatever, no mucus, very little fluid of neutral or very slightly acid reaction (acidity, 2 to 6), no ferments, no lactic acid. The particles of food are very coarse. The stomach is empty in the fasting condition of the patient; there are no hemorrhages. In gastric cancer the tongue is always furred, the gastric contents, as a rule, include considerable quantities of mucus, and the degree of acidity is much higher, even if there is absence of free hydrochloric acid. The fragments of food are not so coarse as in the former condition, lactic acid is frequently present, and numerous micro-organisms are almost always present in the contents.

5. *Severe Form of Gastric Neurasthenia.*—A mistake between gastric cancer and severe forms of neurasthenia will not occur frequently. The neurotic condition which can be found in the patient, implicating several other organs besides the stomach, will help to establish the true diagnosis.

Duration and Prognosis.—The malignant process usually terminates fatally about one year from the commencement of the symptoms. Cases, however, are met with in which the disease runs a more protracted course, eighteen months to two years. On the other hand, very acute, so-called foudroyant cases are observed which end in death in from four to six weeks. The duration of the disease depends, firstly, upon the situation of the neoplasm, which causes more disturbances and rapid death when occupying and occluding the cardiac or pyloric orifice; secondly, upon the character of the growths (some of which, as, for instance, the medullary form, develop rapidly); and thirdly, upon the complications which arise either from ulceration and hemorrhage or from cancerous metastasis.

The prognosis of cancer of the stomach is always hopeless. Oser justly said, the only hope for the patient can be that the physician has made a mistake in the diagnosis. No specific remedy has as yet been discovered for this ailment, and even surgery has not been able thus far to combat this malady successfully.

Treatment.—The treatment comprises: A. Surgical interference; B. Medical treatment.

A. Surgical Interference.—Owing to the futility of medicinal treatment, surgical intervention has been invoked, and several bold operations have been devised, which may be resorted to in appropriate cases. These may be divided into radical and palliative procedures.

a. The radical operations include: (1) Resection of the pylorus; (2) excision of the tumor.

Billroth[1] was the first to prove the possibility of excision of the carcinomatous pylorus, in 1878. Since that time, distinguished surgeons all over the world have been working in this special field of abdominal surgery, and have greatly contributed to the further development of this heroic method of treatment. The aim in total resection of the tumor is to radically cure the patient, *i.e.*, to remove all the cancerous parts of the organ. It will be seen at a glance that the indications for this operation exist as soon as a neoplasm accessible to the knife and operable can be diagnosed. The earlier the diagnosis is made the better are the chances for radical interference. Thus far only very few cases are known in literature in which the excision of the tumor or the resection of the pylorus was followed by a real cure. The reason that these operative procedures have not been so successful as has been expected is that they are resorted to, as a rule, too late. Gastric cancer can rarely be diagnosed before it has contracted adhesions with other organs, or before metastatic deposits have formed elsewhere. Contraindications for these operations are: (1) If cancerous metastasis can be discovered in other organs (liver, glands, etc.); (2) adhesions, *i.e.*, if the tumor is not perfectly movable and found to be adherent to other organs; (3) the large size of the tumor; (4) the presence of high degrees of anæmia or cachexia; (5) very old age.

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[1] Billroth: Wiener klin. Wochenschr., 1891, No. 34.

b. Palliative Operations.—The palliative operations have two purposes in view:

1. To permit of a better introduction of food into the digestive tract.

2. To remove as much as possible the irritating effect of food upon the affected area.

The operations serving this object are:

1. *Gastrostomy*, in malignant affections of the cardiac orifice or of the œsophagus.

2. *Gastroenterostomy*, for malignant affections of the pylorus or its immediate neighborhood.

Gastrostomy consists in establishing an opening between the stomach and the abdominal wall, in order to introduce food by this new passage. The technique of this operation has lately been considerably improved, Witzel's[1] method accomplishing the best results. The indications for this operation exist as soon as dysphagia is well developed and the patient unable to introduce large enough quantities of liquid and semi-liquid food through his œsophagus in order to maintain his bodily weight. To wait until a time when even small quantities of liquid cannot pass through the cardia into the stomach without discomfort and pain does not appear to be advisable, for at this period the operation, as a rule, is more dangerous and affords less relief to the patient. Contraindications for this operation are the weakened condition of the system, caused either by advanced cachexia, very old age, or other conditions.

Gastroenterostomy consists in the establishment of a new communication between the stomach and the small intestines, in this way allowing the chyme to pass directly into the small intestine without previously passing through the pylorus. The indications for this operation exist as soon as the presence of malignant trouble within the organ has been diagnosed, complicated with symptoms of ischochymia, especially

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albl. f. Chirurg., 1891, No. 31.

if a radical operation does not appear to be feasible. The sooner it is done the better. By means of it life can be considerably prolonged and made much more comfortable than is possible by any other treatment. The contraindications are the same as those given above under gastrostomy.

Exploratory laparotomy, which is often performed in this disease, seems to be permissible only in those cases in which the diagnosis, although not positive, admits of the possibility of undertaking some kind of an operation which will afford either a cure or at least some relief to the patient. To make an exploratory laparotomy merely for the sake of diagnosis does not seem to me justifiable.

B. Medical Treatment.—The medical treatment has the following points in view: To strengthen the organism by a proper mode of nourishment, thereby prolonging life as much as possible, and to alleviate the morbid phenomena. The first point can be achieved by a proper diet. The more food the patient can be made to take and to assimilate the better This should be the most important principle in guiding us. Ample variety in the bill of fare and the individual inclination of the patient will have to be considered. Trousseau said that the patient should be allowed to eat what he himself thinks he can best tolerate. The following may be given as general rules: The diet should consist of milk, kumyss, matzoon; farinaceous foods; soups containing leguminous foods in a finely divided state (ground); eggs, either raw or soft-boiled, or well beaten up in soup or milk; small quantities of meat, either raw and well scraped, or broiled; the white meat of a chicken; squab, calf's brain, sweetbreads, oysters, fish, white French bread; crackers, with the addition of a small quantity of sweet butter; tea and coffee, wine, ale. In the later stages of the disease many articles of the just-described diet will not appear suitable, and the maintenance of nutrition becomes gradually more difficult. Here the artificial foods, the various peptone preparations (Wyeth's beef juice, Kemmerich's or Rudisch's peptone, Mosquera's beef jelly, somatose, Armour's beef peptone), are in place.

Medicinal Treatment.—As yet no specific remedy against cancer has been found. The treatment must, therefore, be a palliative one, and chiefly directed toward combating the more pronounced morbid manifestations and alleviating pain. In cardiac strictures Boas[1] recommends the use of potassium iodide. This author reports a case of œsophageal cancer in which he employed sodium iodide (2 to 3 gm. *pro die*) for over six months. During this whole period the patient remained free from symptoms, and even gained nine pounds in weight. I have also administered this drug in several cases of cardiac stenosis, and frequently obtained transient good results. Arsenic has also been given in this affection (solutio arsenicalis Fowleri, three drops three times daily), sometimes with good results. One of the principal remedies which is employed in gastric cancer is condurango. This drug was recommended in 1874 by Friedreich,[2] as a specific against cancer. While, however, further researches did not substantiate this favorable report, but rather proved that condurango has in no way a specific action on cancer, many writers agree that it is an excellent stomachic and as such helps greatly to alleviate some of the gastric symptoms accompanying malignant affections of the stomach. Ewald, Rosenheim, Boas, strongly advocate the use of this drug. I also administer it in the greater number of cases. Ewald usually employs it in combination with hydrochloric acid. Condurango may be given in the form of a decoction, 25 to 200 gm. water, one tablespoonful every four hours; or in the form of fluid extract, of which twenty drops or even more can be given three to four times daily. Another drug from which I have sometimes seen beneficial effects in this malady is methyl blue. I[1] was the first to recommend its internal use in cases of cancer. I have employed it in eight cases of cancerous affection of either the œsophagus or the stomach. In three of these cases I was able to note a great improvement of most of the morbid phenomena. In one case, in which a considerable tumor occupied the gastric region, this appeared to have become somewhat smaller after the drug had been used for about three weeks. This patient took methyl blue for a period covering eight to nine months uninterruptedly, being all the time quite free from pain and not losing in weight, the tumor meanwhile not getting any larger. After this period, however, the tumor began to grow again and the patient rapidly succumbed. Methyl blue is best given in gelatin capsules, 0.2 gm.

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[1] Boas: *l. c.*

[2] Friedreich: Berl. klin. Wochenschr., 1874.

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[1] Max Einhorn: "Ueber die Anwendung des Methylenblau." Deutsche med. Wochenschr., 1891, No. 18.

once or twice daily. While I do not believe that this drug is able to cure a cancerous disease permanently, I am of the opinion that it seems to exert a beneficial action in some cases of cancer.

In all cases in which either decomposition of food or ulceration is taking place, one of the best remedies to alleviate these conditions, and also subdue the discomforts produced by them, is chloral hydrate. Ewald was the first to advise its use, and I also advocate it highly. It may be given in the form of a three-per-cent solution, one tablespoonful every two or three hours. The remainder of the remedies employed is simply symptomatic; thus, in case of pain, opium, morphine, or codeine must be administered. The combination of an opiate with belladonna is very suitable. If there should be a profuse hemorrhage, this will have to be treated similarly to that produced by ulcer. Obstinate vomiting must be controlled either by opiates or, in instances in which vomiting is due to stagnation of food in the stomach, by occasional lavage. Constipation, which is so frequently present, must be relieved, either by mild aperients (rhubarb, compound licorice powder, cascara sagrada), or by enemata, or glycerin suppositories. Occasionally the following pills may be prescribed:

℞ Extr. aloes,
Extr. rhei comp., ... āā 2.0
M. f. pil. No. xx. D. S. One to two pills in the evening.

CHAPTER IX.

FUNCTIONAL DISEASES WITH VARIABLE LESIONS.[1]

HYPERSECRETION.

Hyperchlorhydria.

Synonyms.—Hyperacidity; hypersecretion.

Definition.—The term hyperchlorhydria is applied to a condition in which the gastric secretion is more acid than normally and richer in ferments. Frequently the quantity of juice is also increased, but it is secreted only during the period of digestion.

General Remarks.—While the older writers were acquainted, to a certain extent, with digestive disorders attended with hyperacidity of the gastric juice, it is but quite recently that these conditions have been thoroughly studied and placed on an exact scientific basis. Formerly it was thought that in most disturbances of the stomach the gastric secretion was deficient. Nowadays, since the publications of Riegel,[2] Reichmann,[3] Jaworski and Glusinski,[4] Ewald[5] and others, we know that in almost one-half of all the patients suffering with digestive disorders the gastric juice is rather increased.

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[1] This heading comprises affections in which either the secretory or the motor function (prochoresis) of the stomach is at fault, forming the principal symptoms. Anatomical lesions here are not always present and if present are often of various kinds.

[2] Riegel: Zeitschr. f. klin. Med., Bd. 11 and 12.

[3] Reichmann: Berl. klin. Wochenschr., 1882, No. 40; 1884, No. 48; 1887, No. 12.

[4] Jaworski: Zeitschr. f. klin. Med., Bd. 11, Heft 2 und 3.

[5] Ewald: *l. c.*

According to my own experience, the gastric disorders accompanied with hyperchlorhydria form more than one-half of the number of patients troubled with digestive affections. With reference to this point the following table, which I published in the *Medical Record* of November, 1895, may be of interest:

Table. of Private Patients whose Gastric Contents have been Analyzed During 1889 to 1895.

Number of patients with hypochlorhydria, 187, .	in 89 : HCl = 0, acidity = 2 to 40
	in 31 : HCl = 0, acidity = 40 to 80
	in 67 : HCl +, acidity = 15 to 40
Number of patients with euchlorhydria, 91, . .	in 91 : HCl +, acidity = 40 to 60
Number of patients with hyperchlorhydria, 286. .	in 286 : HCl +, acidity = 60 to 140

Total number of patients, 564.

Thus more than one-half of the cases showed a hyperacid state of the gastric juice.

Whether hyperacidity should be considered as a disease *sui generis* or not, is difficult to decide. Hyperacidity certainly describes only one symptom, showing that the secretory function is increased without pointing to any definite anatomical lesion; but this symptom may be of the greatest importance, and very often covers the whole ground upon which is based the subjective suffering of the patient and the rational treatment at our command. That is the reason why I think it best to discuss hyperchlorhydria in a special chapter.

Does hyperchlorhydria always give rise to digestive disturbances and other symptoms? In order to answer this question it will be best to determine more exactly where hyperchlorhydria begins—*i.e.*, to what degree of acidity we may apply this term. According to the experience of Ewald and others, to which I can add my own, the degree of acidity of the gastric contents about an hour after Ewald's test breakfast varies, as a rule, in healthy people between 40 and 60. A degree of acidity of 70 and above is therefore considered as hyperacidity. The above question will now be put in the following way: Must people with an acidity of their gastric contents of 70 and above always present morbid phenomena? To this I must answer in the negative. From a very large experience, I can assert that we occasionally meet with persons whose degree of acidity of the gastric contents is as high as 100 and even more, without producing any disturbances whatever. This condition need not even be a transient one, but may last for years and still cause no discomfort. This, however, is not the rule, and the greater number of persons with a hyperacid juice are not free from disturbances, but rather present a very characteristic train of symptoms. We speak of a pathological hyperchlorhydria whenever this condition is associated with subjective complaints.

Etiology.—As has been just stated, hyperchlorhydria is of very frequent occurrence. It is met with chiefly in adults, although neither the young nor the old are exempt. In the majority of cases its origin may be traced either to a psychological cause, such as grief or worry, or to mental overwork. It is, as a rule, more frequent among the wealthier and more educated class of people, as lawyers, bankers, etc., although hyperchlorhydria may be met with also among the poor. But in addition to this so-called reflex action of the brain as an etiological factor of the disease, there may also be direct causes; thus, for instance, the habit of taking highly spiced dishes, much ice water, and strong alcoholic drinks is liable to produce this trouble.

Symptomatology.—This disorder is usually characterized by a gradual development. At first the patient experiences an uneasy sensation about two or three hours after dinner. Later this changes into a feeling of distress in the epigastric region, occurring about two hours after each meal, instead of after dinner alone. The pain lasts for an hour or two, or even three, and then disappears. Very often pyrosis accompanies the pain and occasionally regurgitation or water brash takes place. The patients, as a rule, can ease their pain by taking some nourishment, especially one that is rich in albumin; thus the white of an egg, milk, or meat is capable of dispersing the pain. It also disappears after the ingestion of some alkali, as Vichy water or bicarbonate of soda. The appetite is ordinarily not diminished but frequently rather increased. Thirst is generally enhanced. The bowels in most cases are constipated.

The composition of the food is frequently of significance with reference to the character of the pains, which are less intense in people partaking of large quantities of meat and eggs, while they are much more severe in persons living on a chiefly vegetable diet.

Besides the attacks of pain, patients affected with hyperchlorhydria very often suffer from severe headache or attacks of dizziness, which may appear either independently or accompanied by gastric pains. The patients, as a rule, do not lose in weight except in some rare instances, in which a faulty and insufficient diet has been maintained for quite a long time.

Objective Symptoms.—On palpation the gastric region is frequently found tender on pressure, although not actually painful, this tenderness not being limited to one circumscribed spot, but to a larger area covering the greater part of the gastric region. The contour and the size of the stomach are frequently found enlarged, although this condition is by no means characteristic of the affection in question. A splashing sound can be produced after the ingestion of water or after meals, but not in the fasting condition.

On examination of the stomach with a tube in the fasting condition it is found to be empty, or only a few cubic centimetres (five to ten) of gastric juice can be obtained. One hour after Ewald's test breakfast, or two to four hours after Leube-Riegel's test dinner, the gastric contents include an abundance of hydrochloric acid and of the ferments, the acidity being, as a rule, much higher than normally (twice or three times as high). A disc of egg albumen becomes digested in the filtrate of these contents in a very short time (sometimes in half an hour). The gastric contents obtained three to four hours after the test dinner show macroscopically that the meat has been perfectly digested, while starchy substances are yet either unchanged or very little altered. The filtrate of the gastric contents, either after the test dinner or after the test breakfast, will reveal the presence of either starch or large quantities of erythrodextrin. The addition of a few drops of Lugol's solution to the filtrate will produce either a blue color or an intense dark red.

The high degree of acidity is most commonly caused by free hydrochloric acid. The difference between the amount of free hydrochloric acid (as determined by Mintz's or Toepfer's method) and the total acidity is not great, the figure very frequently being from 10 to 20.

The motor faculty of the stomach is usually not impaired; in a few instances it is rather increased. Thus two hours after the test breakfast, or six to seven hours after the test dinner, the stomach is found to be either empty or to contain but very little food. The salol test likewise shows salicyluric acid in the urine as early as an hour after the ingestion of the salol.

The degree of acidity of the urine is frequently diminished during the digestive period. This, however, is not always the case, for occasionally the degree of acidity of the urine and of the gastric contents may be found increased at the same time.

Course.—At the beginning hyperchlorhydria is most frequently intermittent. The patient may suffer from this affection for several days, weeks, or even months, becoming free from the ailment for periods of time which vary from several weeks to months or even years. After this interval the trouble either recurs spontaneously without any apparent cause, or is evoked by a severe mental shock or worry. Later on the periods of remission may become shorter, the periods of hyperchlorhydria longer, and at last this condition may become permanent.

The following is a typical case of hyperchlorhydria:

N. B. O——, 23 years old, complained for the last two and a half years of digestive disturbances which consist in pyrosis, dryness in the throat, drowsiness, and constipation. These symptoms were always present and became aggravated at certain periods of time. Patient has never lost much in weight. For the last three months patient suffered from pains in the gastric region. These appear quite regularly one and a half to two hours after meals, and last for one and a half to two hours. Before meals and shortly afterward patient feels well. Appetite very good.

Present Condition.—Patient looks somewhat pale. Tongue clear, with but a slight coating at the back. Gastric region not painful to pressure; stomach not enlarged.

One hour after the test breakfast: HCl +; acidity = 100; free HCl = 88; dextrin + traces; erythrodextrin + very much.

In the fasting condition, the stomach is empty.

The following represents an atypical case of hyperchlorhydria:

Patient (M. A——) has been ailing for four or five years with pains in the stomach and frequent vomiting. Sometimes she has no pains for two to three weeks, at the end of which time they reappear. The pains occur immediately after meals. She also vomits large quantities of food. On examination I found that the stomach was only sensitive to pressure; otherwise nothing could be discovered. With regard to diagnosis it was questionable whether I had to deal with an ulcer or with some functional disorder of the stomach. The regular treatment for ulcer (milk diet, rest, large doses of bismuth) was instituted, but after a period of three weeks the symptoms had not abated. The pains appeared in the same severity and the vomiting persisted. The failure of the treatment made it probable that there was no ulcer. Patient was examined one hour after a test breakfast, and the following condition found: HCl +; acidity = 100; free HCl = 86. In the fasting condition the stomach was empty. Hyperchlorhydria was diagnosed, and the treatment arranged accordingly. The patient now rallied very quickly and recovered entirely.

Prognosis.—The prognosis in hyperchlorhydria is, as a rule, quite good, except in some cases of a very protracted and severe nature, in which the prognosis regarding the complete disappearance of this condition is bad, although even then there is no danger of a fatal issue.

Diagnosis.—The diagnosis of hyperchlorhydria is made either from the subjective symptoms alone or from these in connection with the results of a chemical examination of the gastric contents. The subjective symptoms characteristic of hyperchlorhydria are:

1. Pain, appearing constantly about two to three hours after meals. Relief from the pain is felt immediately after the ingestion of an alkali, or a little while after the partaking of some food, especially albuminous.
2. Appetite and thirst are either in a healthy condition or increased.
3. No marked cachexia.
4. Constipation.

Although all the symptoms mentioned make the diagnosis of hyperchlorhydria probable, it can be made with certainty only after repeated examinations of the gastric juice.

1. On examination of the stomach in the fasting condition, the organ is either found empty, or contains only a few cubic centimetres of juice.

2. One hour after Ewald's test breakfast the degree of acidity is found greatly increased, owing to the large amount of free hydrochloric acid.

Differential Diagnosis.—In making the diagnosis of hyperchlorhydria, we shall have to exclude all conditions which are liable to give similar symptoms; for instance, gastric ulcer, permanent hypersecretion, and biliary colic. The characteristic symptoms of ulcer have been described above, and we shall here limit ourselves to the remark that the pain of an ulcer, even if this is accompanied by hyperchlorhydria, does not disappear entirely after the ingestion of large doses of alkalies. Permanent hypersecretion is very frequently accompanied by vomiting, and the most intense attacks of gastric pain appear, as a rule, in the middle of the night or early in the morning. On examination with the tube, the stomach in the fasting condition is found to contain considerable quantities of gastric juice (80 to 100 c.c.). Biliary colic, not accompanied by jaundice or by a considerable palpable swelling of the gall bladder, may give rise to errors as to the real cause of the pain. In biliary colic, however, the pains, as a rule, appear later than in hyperchlorhydria (four to five hours after a meal), and are not eased by the ingestion of food or by alkalies. Another means of differential diagnosis is that the pains in biliary colic most commonly extend over the right epigastric and hypochondriac regions, whereas the pains of hyperchlorhydria are felt more in the middle of the epigastrium, although sometimes radiating farther to the right.

Treatment.—Hygienic Regimen.—In view of the fact that hyperchlorhydria is most frequently caused by too much mental work, the daily life of the patient as to amount of work, bodily exercise, mental rest, and pleasure must be regulated. With regard to this point, the same rules will not apply to all, but it will be necessary to individualize each case for itself. Thus business men with a great deal of responsibility resting upon them, lawyers, politicians, and physicians must be sent away from their work to some country place, so as to relieve their brains temporarily from the strain. Ladies moving in high social circles, and participating in all manner of festivities, will have to be restricted to a more quiet life. Again, there are people with large fortunes and without any occupation whatever, who become sick from paying too much attention to their own bodily functions. Here it will be necessary to occupy the mind of these patients with some kind of work.

Cold sponge baths in the morning, bodily exercise of about eight to ten minutes' duration every morning are in most instances of value. Walking once or twice a day for half an hour to an hour, horseback riding, driving, bicycle riding should be highly recommended.

Diet.—All substances that are liable to excite intensely the glands of the stomach must be excluded from the dietary of such patients. Therefore all kinds of acids, including organic acids (citric, tartaric, acetic acid); all kinds of spices, such as pepper, mustard, horseradish, and the like, must be forbidden. The food should consist of material rich in albumin, while the quantity of starchy substances should be diminished. Thus all kinds of meat (even game), fish, oysters, eggs, milk, should be taken in large quantities. Bread and butter are permitted. Potatoes, spinach, asparagus, green peas, farina, and rice should be taken only in small amounts. Whiskey and wines should, as a rule, be avoided. Cacao, weak tea, weak coffee, and beer can be given in moderate quantities.

As a rule, it is advisable to have the patient partake of five or six meals daily, three heavy and two or three lighter ones. The heavier meals should not deviate much from the ordinary bill of fare, while the lighter meals should consist either of a glassful of milk or matzoon, with bread and butter or a cup of cocoa and a few crackers, or occasionally a cup of bouillon with an egg beaten up in it, and some bread, or half a dozen oysters, a few crackers, and a glass of beer. The patient must be impressed with the importance of thoroughly masticating the food and eating slowly, besides resting fifteen to twenty minutes after each meal.

Outline of Diet in Hyperchlorhydria.

		Calories.
7:30 A.M.,	two eggs,	160
	wheaten bread, 50 gm.,	128
	butter, 20 gm.,	163
	milk, 250 gm.,	169

		Calories
10:30 A.M.,	matzoon or milk, 200 gm.,	135
	crackers or bread, 30 gm.,	77
	butter, 10 gm.,	81
1 P.M.,	broiled meat, 100 gm.,	210
	mashed potatoes, 50 gm.,	63
	bread, 30 gm.,	77
	butter, 10 gm.,	81
	weak tea or Vichy water, 200 gm.	
3:30 P.M.,	the same as at 10:30 A.M.,	293
6:30 "	soup (with barley or vermicelli), 200 gm.,	100
	bread and butter (bread, 30 gm.; butter, 10 gm.),	158
	meat (broiled or cooked), 100 gm.,	210
	potatoes, baked, 50 gm.,	60
	green vegetables (spinach, green peas), 50 gm.,	80
	coffee (half milk), 100 gm.,	34
10 P.M.,	oysters and crackers, or cold meat sandwich, one glass of beer,	260
		2,519

Medicaments.—All kinds of alkalies can be used in the treatment of this affection. Where hyperchlorhydria is not complicated with constipation, bicarbonate of soda may be given, either alone or in combination with sugar of milk or peppermint sugar (German Pharmacopœia), in doses of half a teaspoonful to about one teaspoonful three times a day, two hours after meals. Calcined magnesia and magnesia ammonio-phosphorica neutralize four times as much acid as bicarbonate of soda. The following prescriptions are therefore very serviceable:

℞ Sodii bicarbon.,
Magnes. ust., ... āā 20.0 ʒ v.

M. exactissime, f. pulv. D. ad scatulam. S. Half a teaspoonful to a teaspoonful three times daily, two hours after meals.

Or,

℞ Sodii bicarbon., ... 20.0 ʒ v.
Magnes. ust.,
Magnes. ammonio-phosph., . . . āā 10.0 ʒ iiss.

M. exactissime, f. pulv. D. ad scatulam. S. Half a teaspoonful to a teaspoonful three times daily, two hours after meals.

In cases which are accompanied by constipation, magnesia usta and some rhubarb can be added, and here I frequently prescribe the following:

℞ Magnes. ust.,
Pulv. rad. rhei, ... āā 7.5 ʒ ij.
Sodii carbon. exsiccat.,
Sodii bicarbon.,
Elæosacch. menth. pip., ... āā 15.0 ʒ iv.

M. exactissime, f. pulv. D. ad scatulam. S. Half a teaspoonful to a teaspoonful three times daily, two hours after meals, to be taken in plain water or in Vichy water.

Bouveret uses sodium bicarbonate in 2 gm. doses, to be taken two hours after lunch and after supper, and to be repeated after an hour's interval. The alkaline treatment can be continued for very long periods without any ill effects whatever. In cases in which the nervous element is more disturbed (sleeplessness, headaches, over-excitability, etc.), we should give a good dose of a bromide salt. I am in the habit of prescribing strontium bromide:

℞ Stront. brom. puriss., ... 12.0 ʒ iij.
Aq. menth. pip., ... 60.0 ʒ xv.

S. One teaspoonful twice daily in milk at mealtime.

Sodium bromide and ammonium bromide can be employed in the same way. The bromides should, however, be given only for a week or two, and their use then discontinued for a short time, after which they may be resumed for the same length of time. Boas advises the administration of small doses of morphine or codeine. He frequently prescribes the following:

℞ Magnes. ust., ...	15.0	ʒ iij¾.
Morphinæ hydrochlor., ...	0.1	gr. i⅔.

M. f. pulv. D. ad scat. S. A point of a knife to a teaspoonful three times daily.

I have very seldom seen the necessity of prescribing either morphine or codeine in this affection.

Of the watering-places, Vichy and Neuenahr are to be highly recommended. For the treatment of these patients at home these mineral waters are taken most advantageously in small quantities.

Electricity.—In cases of a protracted nature, the direct application of the electric current to the inside of the stomach is frequently of the greatest benefit. In most instances the faradic current should be applied, but in cases in which the pains are very severe galvanization should be employed. As to the mode of application of the current and the length of time required for this treatment, see the section on electricity. The electric current applied in this manner exerts a stimulating tonic influence, not only upon the stomach, but also upon the small and large intestines. I have frequently seen cases of hyperchlorhydria, accompanied by the most obstinate constipation, perfectly cured by means of the current, even when no drugs whatever had been given.

Gastrosuccorrhœa Continua Periodica (*Reichmann*).

Synonyms.—Gastroxynsis (Rossbach); periodic continuous flow of gastric juice.

Definition.—Gastrosuccorrhœa continua periodica is a condition characterized by the acute appearance of a constant secretion of gastric juice giving rise to attacks of vomiting and severe pains.

General Remarks.—Organic affections of the peripheral or central nervous system are present in some cases of this disorder, although it may occur in persons who are apparently free from nervous troubles. Reichmann[1] was the first to call attention to the periodic continuous flow of gastric juice; a few years previously Rossbach[2] had described under the name of gastroxynsis a nervous affection of the stomach, which consists in a sudden appearance of severe headaches accompanied by gastric pains and vomiting of very acid chyme or gastric juice. In accordance with Boas, I consider gastroxynsis and gastrosuccorrhœa continua periodica to be one and the same affection, and do not think they should be treated under different headings.

Symptomatology.—In the midst of perfect health a sensation of discomfort is experienced in the gastric region, which is associated with restlessness. Soon afterward the discomfort changes into a rather painful sensation, and nausea appears. The patient is compelled to occupy a recumbent position. The symptoms just described continue or rather increase in severity, and in about an hour or two the nausea ends in vomiting of a large quantity of gastric contents. The patient may now feel a little relieved for a short time, but soon the same symptoms return. The appetite is entirely lost and instead there is extreme thirst. The more the patient drinks the more, as a rule, he has to vomit. If he abstains from drinking, the vomiting is less frequent, but persists nevertheless. Thus, as a rule, in the middle of the night or early in the morning, the patient has to vomit a large quantity of a watery liquid which is very acid in character, and either quite clear or greenish from the admixture of bile. If this liquid be examined it will be found that free hydrochloric acid is present in large quantities, as are the ferments (rennet and pepsin). No food particles can be discovered in the fluid. It consists of either clear gastric juice or gastric juice with admixture of a little bile. After such an attack frequently a constant desire to vomit persists, and the patient suffers from very violent and painful retching. Often a quarter of an hour after the last paroxysm, the patient's efforts to vomit cause a small quantity of clear yellow bile to be ejected. Even if the patient absolutely abstains from all kinds of food and drink, a few hours later a large quantity of gastric juice may again be vomited. The patient in this condition is hardly able to sleep for any length of time, as the pain awakens him soon after he has fallen asleep.

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[1] Reichmann: Berl. klin. Wochenschr., 1882, No. 40.

[2] Rossbach: Deutsch. Arch. f. klin. Med., 1885, Bd. 35.

The abdomen, as a rule, is sunken. The patient looks extremely pale, and his extremities are frequently cold. Severe headaches often accompany this train of symptoms, and constipation is almost a constant concomitant. After this condition has lasted for two or three days, or sometimes even longer, the nauseous feeling begins to disappear, the pains subside, and the patient experiences for the first time a desire for food. He is now able to eat without vomiting, and in a day or two feels like himself again. It is characteristic of this affection that the symptoms disappear almost suddenly, and that the patient who seemed to be in a wretched state a few hours before may now appear nearly well.

After a period of perfect euphoria, varying from several weeks to a few months or a year or even longer, a similar attack may occur. The attacks may then either recur after the same period of time, or the intermissions of health may become gradually shorter, so that ultimately the patient has hardly recuperated from his last attack before a new one supervenes. The latter condition forms the intermediary stage between periodic and chronic gastrosuccorrhœa.

During the free intervals the gastric secretion takes place either in a perfectly normal manner or hyperchlorhydria may exist. In either case, however, the stomach remains free from secretion in its empty state.

The following cases may serve as good illustrations of this affection:

Case I.—R. B. I——, aged 37, business man. During 1890 and 1891 patient had several attacks of the then prevailing grippe. In December, 1892, after the third attack of the grippe, he was taken ill with a stomach trouble, the nature of which patient describes as follows: "I was seized suddenly with a fit of vomiting, entirely emptying the stomach apparently, but followed by successive spells, at an interval of one to two hours, accompanied by the most intense pain. This would last from twenty-four to thirty-six hours, and sometimes forty-eight, after which the stomach would gradually quiet down so that nourishment in the form of milk—either hot milk or kumyss—could be taken in small quantities at intervals of about two hours, until a normal condition was restored, which usually took from two to three days to accomplish.

"The character of the vomit was, first, that of undigested food, followed by a strong and very acid fluid of a whitish, and finally of a greenish color, consisting principally of bile. After each of the spells mentioned the intense pain would subside, and I would fall asleep—to be awakened again by a recurrence of the pain—the intervals of sleep and suffering varying from an hour to three as I became better, and continuing until vomiting had ceased.

"During all these spells I was exceedingly nervous—the slightest noise or vibration causing pain and sometimes causing the vomiting. General condition after becoming able to sit up was one of extreme weakness—having lost from ten to twenty pounds, as the attacks were longer or shorter.

"During 1893 I was ill four or five times, in 1894 as often, and in 1895 four times. Weight previous to grippe averaged 135 to 138 pounds; since these attacks it has varied from 125 to 133."

Present Condition.—July 22d, 1895.—Chest organs normal. The palpation of the abdomen does not reveal any pathological condition. The splashing sound can be easily produced in the gastric region, and extends downward to about two fingers' width below the navel. Knee reflex present. Urine does not contain any sugar or albumin. Besides the above-described attacks of vomiting, patient complains of a feeling of heaviness in his gastric region about one hour after meals, and of slight constipation.

July 23d.—Examination of the gastric contents one hour after Ewald's test breakfast: HCl +, acidity = 100, free HCl = 86.

October 8th.—Patient is in bed suffering from one of the attacks mentioned; he has vomited several times during the day and is suffering from intense pain. On inspection the abdomen is slightly sunken; on palpation the whole gastric region is found extremely sensitive and painful to pressure. The hands and also the face (particularly nose and forehead) are somewhat cold; pulse, 110; temperature, 98° F. The vomited matter consists of a pretty clear fluid with an abundant admixture of mucus; no food particles can be discovered in the liquid. On chemical examination free HCl as well as pepsin and rennet are found present in large amount. Patient complains of intense thirst. Under the administration of opiates he grew better and was able to leave his bed after three days.

Case II.—George N. J——, 42 years of age, merchant, suffered for five years from frequently appearing attacks of pains in the region of the stomach. These attacks were usually accompanied by vomiting of highly acid substances; they recurred once every three to four weeks and lasted about three days. During the attack the patient felt miserable and down-hearted, suffered from severe pains; was not able to eat anything and vomited frequently. When the attack was over he felt perfectly well, except that his sleep was somewhat disturbed.

The physical examination shows: Chest and abdominal organs intact; the patellar reflex present; stomach not dilated (the site of the stomach having been determined by gastro-diaphany).

August 31st, 1891.—One hour after test breakfast, HCl + , acidity = 66.

The patient was directly gastro-faradized for a period of two months. He had no attack during the time of treatment, nor any thus far after it was discontinued; sleeps well and feels stronger and full of life.

Diagnosis.—The diagnosis of gastrosuccorrhœa continua periodica can be made by the above-described symptoms, in connection with the examination of the vomited matter (which is found to consist principally of clear gastric juice without admixture of much food), or with the examination of the stomach in the fasting condition by means of the tube (which results in the withdrawal of a considerable quantity of clear gastric juice). Inasmuch as similar attacks of gastrosuccorrhœa may occur as a consequence of either an open ulcer or a cicatrix within the stomach, the pylorus, or the duodenum, it will be necessary to exclude such organic affections before making a diagnosis of continuous periodic gastric flow, which we consider to be a nervous affection. It will also be of importance to exclude organic spinal or cerebral troubles, which may cause a similar disorder of reflex origin.

Prognosis.—The prognosis of pure gastrosuccorrhœa continua periodica is, as a rule, not bad. In many instances it is possible either to make the attacks less severe, or in some instances to effect a cure by rational treatment.

Treatment.—It will always be advisable to analyze the gastric juice of the patient during the free intervals. If hyperchlorhydria is found this will have to be treated (see p. 296), even if there should be no subjective complaints; for hyperchlorhydria is frequently, although not always, the cause of such attacks. At any rate, a hygienic way of living should be inaugurated by the physician. I am in the habit of prescribing a good-sized dose of bromide as soon as the patient feels an attack coming on, and find that occasionally it may be cut short at the very beginning. In some instances the attack, although not interrupted in its progress, is thereby rendered less severe. When the attack has appeared the patient must be kept in bed. A hot-water bag is placed over the gastric region, and if the pains are severe an opiate, either alone or in combination with belladonna, is administered. During the first day of the attack no nourishment whatever should be given. A teaspoonful of cold water or a small ice pill can be administered from time to time, especially if the patient is very thirsty. The next day small quantities of milk, matzoon, or egg water, one or two tablespoonfuls, are given every hour. On the third day the quantity of nourishment may be increased to half a cupful at a time administered every two hours, and besides the above liquid food the white of a hard-boiled egg chopped up fine may also be given (one or two eggs a day). On the fourth day meat (scraped, raw, or broiled) may be tried, and afterward the diet gradually arranged as for cases of hyperchlorhydria. The system of diet as laid down here for every day from the beginning of the attack will certainly depend upon the condition of the patient, and will have to be modified accordingly. As there is always constipation during the attack, it will be best to move the bowels on the second or third day, either by a glycerin suppository or by a large injection of water (a quart of water and a teaspoonful of salt), or an injection of sweet oil (one pint).

Gastrosuccorrhœa Continua Chronica (*Reichmann*).

Synonyms.—Chronic continuous flow of gastric juice; Reichmann's disease.

Definition.—Reichmann,[1] in 1882, described under the above name a disorder which is characterized by a constant secretion of gastric juice, even in the absence of food in the stomach. Considerable quantities of gastric juice can be withdrawn from the stomach in the morning, even in the fasting condition.

General Remarks.—In describing this new disease Reichmann in 1887 mentioned that he had observed sixteen cases. An exact scientific diagnosis had been made, however, only in six of them. "In the remaining cases," says Reichmann, "I was able to find in the stomach in the morning in the fasting condition a large quantity of a liquid containing hydrochloric acid and pepsin, and exhibiting digestive properties, but also containing much peptone and remnants of amylaceous food."

Among the six cases which Reichmann considered as typical of gastrosuccorrhœa chronica, I think that only one (Case 3) deserves this name, for the remaining five, aside from the constant secretion of gastric juice, presented other important lesions of the stomach, which in all probability were rather the cause than the effect of the constant gastric flow. In all the cases described by Reichmann, except in Case 3, the stomach in the fasting condition contained a considerable quantity of liquid, consisting of gastric juice, and containing only amylaceous food remnants. When the stomach had been washed out on the previous night, and the patient had abstained from food or drink, the stomach in the morning nevertheless contained clear gastric juice. These cases are then undoubtedly cases of dilatation of the stomach, or, more correctly speaking, of stenosis of the pylorus, in which hypersecretion must be considered as a concomitant factor. Reichmann, and following him, especially the French writers Bouveret,[1] Debove and Rémond,[2] and among the Germans Riegel,[3] have laid too little stress upon the distinction between the constant flow of gastric juice and dilatation of the stomach due to stenosis of the pylorus. On this account the picture given by these authors of the true gastrosuccorrhœa chronica bears a closer resemblance in many points to that of dilatation of the stomach than to the picture of the affection in question. Inasmuch as the treatment of cases of stenosis of the pylorus is in most essential points different from cases of gastrosuccorrhœa (I need only mention that the most rational treatment for the former is a surgical one), it is absolutely necessary strictly to differentiate between these two conditions.

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[1] Reichmann: Berl. klin. Wochenschr., 1882. No. 40; 1884, No. 48, and 1887, No. 12.

About two years ago Schreiber,[4] of Königsberg, published an extensive paper in which he expressed doubt as to the existence of the new disease, regarding all the cases described by Reichmann as cases of dilatation of the stomach with stagnation of food. Shortly afterward two other important papers appeared with reference to this question. Riegel defended Reichmann's views, while Martius[1] was inclined to favor Schreiber's opinion. Whether Schreiber's view, that the stomach normally secretes gastric juice even while in its empty state, is correct or not, is a question that is quite difficult to decide, although I am personally of the opinion that when there is no food in the stomach there is no secretion. But leaving aside this question about the physiology of the stomach, there is no doubt that, as a rule, the stomach in the fasting condition does not contain any considerable quantity of gastric juice. Whenever larger quantities are found the stomach must be regarded as affected.

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[1] Bouveret: "Traité des Maladies de l'Estomac."

[2] Debove et Rémond: "Les Maladies de l'Estomac."

[3] Riegel: Deutsche med. Wochenschrift, 1893, Nos. 31 und 32.

[4] Schreiber: Deutsche med. Wochenschr., 1893, Nos. 29 und 30.

Etiology.—Gastrosuccorrhœa chronica is met with much more frequently in men than in women. In some instances there is present besides this affection some other functional neurotic disturbance. In three of my cases the latter was very marked. Thus one of these patients complained of a burning sensation all over his limbs, which lasted for three months and then suddenly disappeared. Like hyperchlorhydria, gastrosuccorrhœa seems to arise from great mental worry or strain.

Symptomatology.—After a more or less prolonged period of different dyspeptic disturbances which are similar in character to those caused by hyperchlorhydria, there appears a pronounced sensation of pain several hours after and shortly before meals. Very soon vomiting supervenes as a new symptom. At first it occurs only occasionally, but constantly grows more frequent until at last there may be one or several vomiting spells every day. The vomiting appears most frequently soon after breakfast, sometimes also after supper. In only a few cases does it occur in the night, about two or three o'clock, preceded by a long and severe attack of pain. The vomited matter is always very acid and more or less liquid. The night vomit consists, as a rule, of a clear liquid containing hardly any food.

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[1] Martius: Deutsche med. Wochenschrift, 1894.

The appetite is generally increased, although there are exceptions to this rule. In some cases periods of extreme hunger alternate with periods of pronounced anorexia. In most cases the sensation of thirst is greatly increased. In all of my cases constipation was marked. In some there was loss of weight, but none of my patients was emaciated in any great degree.

Diagnosis.—Although the symptoms described might suggest the presence of gastrosuccorrhœa in certain cases, the exact diagnosis can be made only by a repeated examination of the stomach in the fasting condition. By inserting the tube into the stomach, and telling the patient to exert some pressure with his abdominal muscles, more or less liquid (60 to 100 c.c.) is obtained from the stomach. This contains no food particles, but exhibits all the properties of the gastric juice. It may look greenish from the admixture of bile, but this is not an important sign. The filtrate, as a rule, shows a somewhat increased degree of acidity. It never contains any starchy products (absence of erythrodextrin, achroödextrin, and sugar).

Microscopically no sarcinæ or other signs of decomposition are found. Frequently cell nuclei are met with in large numbers. In examining the patient one hour after Ewald's test breakfast, the gastric contents will be found to contain more liquid than usually, and the degree of acidity will be quite high (80 to 120). As a rule, the degree of acidity of the gastric contents is higher than that of the gastric juice when withdrawn from the stomach in the fasting condition. In examining the filtrate of the gastric contents with reference to the starchy products, it will be found that the Lugol solution will produce a deep violet or even blue color, showing that the starch has not been much changed. A thin disc of hard-boiled egg will be digested in the filtrate at blood temperature in about half an hour to an hour. The difference as to the degrees of digestion of the albuminates and starches (the former being more quickly, the latter much more slowly digested) can be best studied after Leube-Riegel's test dinner. Three to four hours after such a dinner the obtained gastric contents show hardly any meat particles whatever (all being digested), whereas particles of starchy food form the principal part of the mixture. In this way the difference between the digestion of meats and starchy foods existing in this affection is seen at once.

Differential Diagnosis.—In making the diagnosis of gastrosuccorrhœa, all organic lesions of the stomach (ulcer and stenosis of the pylorus) which are liable to be accompanied with gastrosuccorrhœa will have to be excluded. According to my experience, it is easy to exclude stenosis of the pylorus, but not an ulcer. In stenosis of the pylorus the stomach in the fasting condition is also found to contain a liquid, but this is mixed with food and the filtrate always shows the presence of starch or sugar products. But the main thing is that food articles can be seen even with the naked eye, whereas the liquid found in the stomach in case of genuine gastrosuccorrhœa does not contain any food particles, as described above. The presence of an ulcer will be suspected if there has been a preceding hæmatemesis or melæna or a circumscribed spot in the gastric region very painful to the slightest pressure. The absence of these symptoms will tend to justify the diagnosis of gastrosuccorrhœa.

In this respect I agree with Reichmann as to the existence of a pathological continuous gastric succorrhœa, although I restrict this name to cases not presenting any organic lesions of the stomach. Whenever the latter exist, I deem it best to look upon the accompanying gastric succorrhœa as a consequence of the main trouble, but not as the cause of the organic lesion. According to my experience, which coincides with that of Ewald, cases of genuine gastrosuccorrhœa chronica are quite rare. They are less frequent than those of periodic gastrosuccorrhœa. During the last eight years I have met with eight cases of this affection, one of which I[1] published in 1887. The following is the description of one of my recently observed typical cases of gastrosuccorrhœa:

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[1] Max Einhorn: New Yorker medicinische Presse, 1887.

A. S——, 21 years old, has suffered since early youth from digestive troubles. As far back as he can remember, he has felt hungry very soon after meals (one hour). The bowels, although usually regular, were at times very constipated. Patient was always weakly, but in the last three years he has been troubled to a much greater degree. He felt extremely weak, became dizzy after meals, and was overcome by a feeling of sleepiness. The bowels became constipated all the time. During the last six or seven months there was a sensation of extreme weakness in the hands and feet. The appetite was constantly increased, and a hungry feeling appeared very frequently. For the past three months there had been a burning sensation in the gastric region, which increased in severity about an hour or two after meals. From that time on the patient began to vomit frequently. The vomiting, as a rule, occurred very soon after a meal, although occasionally it took place either in the middle of the night or in the morning before breakfast. Patient had lost lately in weight (about ten pounds).

Present Condition.—Chest organs intact. On palpation, the gastric region is somewhat sensitive to pressure. There is, however, no circumscribed painful area. A splashing sound can be produced extending to about one finger's width above the navel. The tongue is thickly coated. The color of the lips and cheeks is quite good, and the patient does not look emaciated. The knee reflex is present, and the urine does not contain anything abnormal. The examination of the stomach one hour after a test breakfast showed the quantity of chyme to be small (about 30 c.c.); hydrochloric acid +, acidity = 100.

The examination of the stomach in the fasting condition revealed the presence of a considerable quantity of pure gastric juice; 120 c.c. of a somewhat turbid liquid, not containing any food remnants whatever, were withdrawn with the tube. This fluid contained free hydrochloric acid, had an acidity of 80, gave only weak biuret reaction, while erythrodextrin, dextrin, and sugar were wholly absent. During the first three months of treatment the condition of the stomach in reference to its secretion of juice did not change in any way. Repeated examinations, which had been made in the fasting condition of the patient, always gave the same result: presence of about 100 c.c. or more of pure gastric juice.

The treatment consisted at first in regulation of the diet, and in the administration of large doses of alkalies. Later on washing of the stomach and spraying of the organ with a 1 to 2:1,000 solution of nitrate of silver was instituted. The latter means proved more effective than the former treatment, and after about two weeks it was noticed that the stomach in the fasting condition contained considerably smaller quantities of juice. Frequently but 30 or 20 c.c. of juice were found. The spraying was continued for two months, after which time the stomach in the fasting condition was usually found empty. This objective improvement was connected with a subjective amelioration of all the symptoms: the vomiting ceased, the hunger was much less marked, the dizziness subsided, and the patient felt stronger and could do his work much better. The examination of the stomach one hour after the test breakfast, however, showed that the hyperchlorhydria still persisted. In this case we frequently tried to determine the motor (transportation) faculty of the stomach. One and a half hours after Ewald's test breakfast, as a rule, the stomach was found empty, showing that this faculty was rather increased. This is of interest, inasmuch as it shows that continuous hypersecretion need not be associated with sluggishness in the muscular action of the organ, a theory which is accepted by most investigators who have written on the subject.

The following is another typical case of continuous hypersecretion.

S——, 46 years old, has been suffering from digestive disturbances since 1893. The principal symptoms consist in pains appearing in the gastric region about three hours after meals and also early in the morning before arising. The appetite was always good. Thirst is frequently greatly marked and with it a sensation of dryness in the mouth.

The pains are almost always relieved either by food or by bicarbonate of soda. Steady brain work, strain in business, and worry greatly aggravate the condition, while a stay in the country and rest materially diminish the symptoms. There were several intermissions of the symptoms extending over a period of a few months' duration. But thus far they have always returned. Constipation exists in a high degree.

On examination the stomach is found to extend to two fingers' width below the navel; the gastric region is not painful to pressure.

One hour after test breakfast: Quantity of chyme (consisting of fine pieces of roll and a watery liquid) amounts to 500 c.c. HCl +, acidity = 108, free HCl = 92, erythrodextrin + much.

In the fasting condition, the stomach contains 130 c.c. of a watery liquid not mixed with any particles of food. HCl +, acidity = 100, free HCl = 90, erythrodextrin = 0.

Several other examinations gave similar results, and for quite a while the stomach in the fasting condition usually contained from 70 to 140 c.c. of clear gastric juice. The treatment consisted in the application of intragastric galvanization and spraying with nitrate of silver. The symptoms gradually subsided.

Prognosis.—According to my experience, the prognosis of gastrosuccorrhœa is not bad. As a rule, most patients improve under rational treatment. Frequently, however, there are relapses. Some very obstinate cases are occasionally met with, and the trouble, although yielding somewhat to treatment, may persist for years. There is, however, no danger of a fatal issue resulting from this disease alone.

Treatment.—As we have seen, gastrosuccorrhœa is always associated with hyperchlorhydria. The treatment of the latter condition in reference to diet, drugs, and mode of living will have to be resorted to here also. With reference to diet, I have only to add that it is of great importance not to permit the patient to partake of any large quantities of liquid. In this affection more stress must be laid upon this point than in hyperchlorhydria.

Medicaments.—The treatment of gastrosuccorrhœa must be directed toward decreasing the undue amount of gastric secretion. With this end in view, Voinovitch[1] recommends the use of atropine in doses of 2 mgm. (gr. $\frac{1}{32}$) daily. Bouveret prefers morphine to atropine. Following the advice of Leubuscher and Schaeffer,[2] he administered as much as 2 to 3 cgm. (gr. $\frac{1}{3}$–$\frac{1}{2}$) of sulphate of morphine three times daily by subcutaneous injection. This author doubts, however, whether this treatment, which seems to be effective in the initial state of the affection, will prove useful in cases that have progressed further. The use of either atropine or morphine may be tried for a short time, but they should never be administered for a long period. The subcutaneous injections of morphine especially should be avoided, as the patient runs the risk of becoming an *habitué* of this drug.

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[1] Voinovitch: La Semaine médicale, April 6th, 1892.

[2] Leubuscher und Schaeffer: Deutsche med. Wochenschr., 1892.

Large doses of subnitrate of bismuth (2 gm. or half a drachm in a wineglassful of water three times daily half an hour before meals) seem to have occasionally very good effects. Wolff[1] recommends Carlsbad salt or

℞ Sod. sulph.,	30.0
Potass. sulph.,	5.0
Sod. chlorat.,	30.0
Sod. carbon.,	25.0
Sod. bicarbon.,	10.0

M. f. pulv. Half a teaspoonful in half a glassful of lukewarm water three times daily: the first portion to be taken in the fasting condition, the second two hours before the midday meal, and the third two hours before supper.

Riegel[2] likewise speaks highly of this mode of treatment.

Lavage.—Reichmann, and later Riegel, recommend the use of lavage of the stomach as the best means of improving its condition. While Riegel washes out the stomach in the evening six to seven hours after the heavy meal, Reichmann and most writers administer the lavage in the fasting condition. The latter way is also employed by myself; it has the advantage that, by emptying the stomach in the fasting condition, we are better enabled to judge of the quantity of juice present, at a time when normally there should be none; and also that no food whatever is removed from the stomach.

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[1] Wolff: Zeitschrift f. klin. Med., Bd. xvi.

[2] F. Riegel: "Die Erkrankungen des Magens," Wien, 1896, p. 268.

Instead of lavage Boas recommends emptying the stomach by means of a tube in the fasting condition (expression method).

In order to combat more effectively the undue secretion, Reichmann recommends adding nitrate of silver to the water used in washing out the stomach. After it has been washed out with plain water, 300 c.c. of a 1 or 2 : 1,000 solution of nitrate of silver is poured into the organ, and left there for about five minutes, when it is withdrawn by siphonage.

Spraying the Stomach.—Instead of the latter proceeding I have sprayed out the stomach after washing with a 1 or 2 : 1,000 nitrate-of-silver solution. In two cases I found this method of treatment of great benefit.

Direct Galvanization.—The first of my observed cases of gastrosuccorrhœa chronica was a very obstinate one, and the affection did not yield much to either the medicinal treatment or to the use of lavage. I empirically tried direct galvanization of the organ, and after a treatment of a few weeks the stomach began to be empty in the morning, and has remained so for several years. Since then it has been my custom to make use of this method in this affection, and I must say that the result has been very gratifying. Very often I employ both spraying with nitrate of silver and direct galvanization, applying them alternately.

CHAPTER X.

FUNCTIONAL DISEASES WITH VARIABLE LESIONS.—*Continued.*

Achylia Gastrica.

Synonyms.—Atrophy of the stomach; anadenia ventriculi; phthisis ventriculi.

Definition.—This term embraces a class of cases in which there is a permanent absence of gastric secretion.

General Remarks.—In 1892 I[1] suggested the term "achylia gastrica" for those conditions in which the stomach apparently secretes no juice and in which clinically the diagnosis of "atrophy of the gastric mucosa" seems to be justifiable. In a paper referring to this subject I endeavored to show that cases of achylia gastrica and cases of pernicious anæmia ought to be kept strictly apart. Whereas the latter, as a rule, end fatally, the former do not necessarily endanger the life of the patient. As a proof of this view I described a case of achylia gastrica which I had under observation for four years and whose condition had meanwhile somewhat improved, and another case in which the history given by the patient made it probable that the stomach had persisted in this state of juicelessness for forty years. In this case there were no subjective symptoms present and the patient used to partake of the heaviest food with perfect impunity. In all these cases the small intestine acts vicariously and completely replaces the lack of digestion of the stomach.

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[1] Max Einhorn: Medical Record, June 11th, 1892.

In regard to the literature of "atrophy of the gastric mucosa" I refer to the excellent paper of S. Fenwick,[1] who first described this condition in cases of pernicious anæmia, and to the work of Lewy,[2] Ewald,[3] Henry and Osler,[4] Kinnicutt,[5] Nothnagel,[6] and George Meyer.[7]

In all cases described by these writers (mostly pernicious anæmia) the autopsy showed the disappearance of the gastric glands. Henry and Osler have given various characteristic drawings illustrating the microscopic picture of this condition.

In most cases of atrophy of the stomach mentioned in literature the sickness in question is one in which all the functions of the stomach are disturbed and which gradually leads to death. There have been described, however, a few cases of atrophy of the stomach in which the clinical symptoms, or, more correctly, the chemical analysis of the stomach contents led to the above diagnosis, which by no means seemed to present such a severe irreparable disease. In these cases no autopsies could be made, and atrophy of the stomach, although it must here be conjectured, is not as yet proven to exist. Cases belonging to this latter group have been described by Grundzach,[1] Ewald,[2] Wolff,[3] Jaworski,[4] Boas,[5] Rosenheim,[6] Litten,[7] and myself.[8] For these cases the name achylia gastrica seems to be best adapted.

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[1] S. Fenwick: "Atrophy of the Stomach." The Lancet, July, 1877.

[2] B. Lewy: Berliner klin. Wochenschr., 1887, No. 4.

[3] C. A. Ewald: *ibid.*, 1886, No. 32.

[4] Henry and Osler: American Journal of the Medical Sciences, vol. 91, 1886, p. 498.

[5] F. P. Kinnicutt: American Journal of the Medical Sciences, vol. 94, 1887, p. 419.

[6] Nothnagel: Deutsch. Arch. f. klin. Medicin, Bd. xxiv., Heft 4 und 5.

[7] George Meyer: "Zur Kenntniss der sogenannten 'Magenatrophie.'" Zeitschrift für klinische Medicin, Bd. xvi., p. 366.

The recent literature on cases of pure achylia gastrica (not complicated with pernicious anæmia) is not very extensive. Simultaneously with my article on "Achylia Gastrica" Ewald[9] published a paper entitled: "A Case of Chronic Disability of Gastric Secretion (Anadenia Ventriculi?)." Ewald's views are in perfect accord with mine. The patient reported in the paper had been observed by Ewald for two and a half years. Although this patient improved considerably in every respect and gained forty-two pounds in weight, the chemical examination of the gastric contents showed a total lack of juice.

In this country Allen A. Jones[10] has described under

[1] J. Grundzach: Berl. klin. Wochenschr., 1887, No. 30.

[2] C. A. Ewald: "Ueber das Fehlen der freien Salzsäure im Mageninhalt." Berl. klin. Wochenschr., 1887, No. 30.

[3] L. Wolff: *ibid.*

[4] Jaworski: Wiener medicinische Wochenschr., 1886, Nos. 49–52.

[5] I. Boas: Münchener med. Wochenschr., 1887, Nos. 41 und 42.

[6] Rosenheim: Berl. klin. Wochenschr., 1888, Nos. 51, 52.

[7] M. Litten und Rosengart: Zeitschr. f. klin. Medicin, 1888, p. 573.

[8] Max Einhorn: "Ein Fall von continuirlichem Magensaftfluss und ein Fall von vollständigem Fehlen der Salzsäure im Magen." New Yorker medicinische Presse, September, 1888.

[9] Ewald: Berliner klin. Wochenschr., 1892, Nos. 20 und 27.

[10] Allen A. Jones: New York Medical Journal, May 27th, 1893, p. 573.

the name of "Gastric Anacidity" four cases belonging to this class of affections. Recently D. D. Stewart[1] has written a very valuable paper on the same subject.

Morbid Anatomy.—There exist but few cases of achylia gastrica in which autopsies have been made.

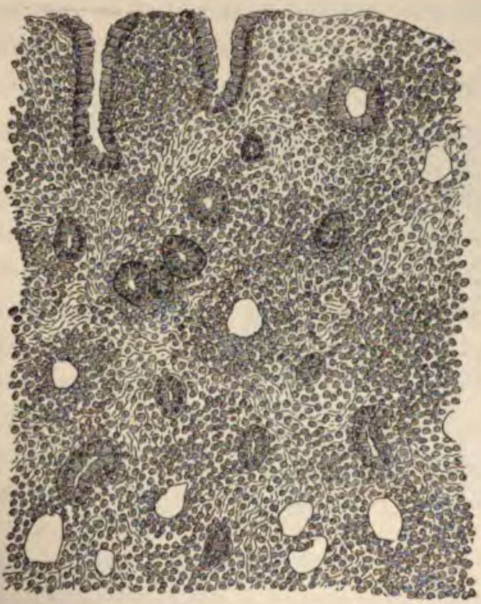

FIG. 47.—A Small Piece of Gastric Mucusa (from Patient D. S., with Achylia Gastrica) Found in Wash-water from Stomach. Only few glands visible: empty spaces where glands had previously existed; general small round-cell infiltration. × 80.

One case, observed by me, showed a complete atrophy of the gastric tubules (see p. 166, Fig. 38).

As to the question whether in all cases of achylia gastrica there necessarily exists an anatomical lesion (atrophy of the glands) or not—*i.e.*, whether cases of achylia might not perhaps occur in which the gastric mucosa is not much altered, I must say from my own experience that the latter is frequently the case. This is the reason why a repair of this condition is occasionally observed.[1]

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[1] D. D. Stewart: American Journal of the Medical Sciences, ber, 1895.

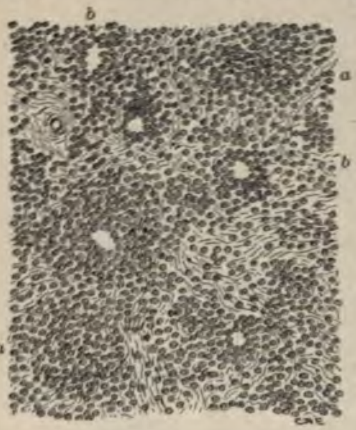

FIG. 48.—A Small Piece of Gastric Mucosa (from Patient R. H——, with Achylia Gastrica): no glands visible; *a*, general small round-cell infiltration; *b*, empty spaces where glands had previously existed. × 80.

Etiology.—According to the views generally entertained, achylia gastrica is a sequel to certain severe chronic catarrhal conditions of the stomach. The more recent text-books on gastric diseases (Ewald, Boas, Bouveret) discuss this affection under the head of "Gastritis Glandularis Chronica." I certainly believe that such an origin of achylia gastrica is sometimes traceable. The cases of chronic gastric catarrh in which the acidity is pretty low (10 to 20), and in which no free HCl exists, but both the biuret reaction and rennet are present, speak in favor of this view. They represent, so to say, the prodromic stage of achylia gastrica. Notwithstanding this it seems to me more than probable that the affection in question may develop also in some other way (in consequence of nervous disturbances). In such instances the glandular layers of the stomach need not necessarily be greatly altered, although it appears probable that after a long persistence of inactivity of the glands these may begin to atrophy.

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[1] Max Einhorn: "A Further Report on Achylia Gastrica." Medical Record, July 6th, 1895.

Symptomatology.—With regard to their subjective complaints patients with achylia gastrica may be divided into three groups:

1. Patients without any subjective symptoms whatever and enjoying perfect euphoria;
2. Patients presenting a variety of gastric symptoms associated with mild intestinal disturbances;
3. Patients without any apparent gastric symptoms, but with severe and obstinate intestinal disturbances.

Cases belonging to the first group are quite rare. I therefore do not deem it superfluous to describe here such a case without any gastric or intestinal symptoms, which possesses the further interest that it was complicated with rumination.

Achylia Gastrica, Combined with Rumination.—August R——, 52 years of age, carpenter, was always well and had not consulted a physician for the last twenty years. Suffered in his boyhood from frequent headaches, cramps in the abdomen, and diarrhœa until his twentieth year. The patient attributes the griping pains in his abdomen at that time to the circumstance of growing up under poor and miserable surroundings; as a rule he had very little to eat; from time to time, however, he worked in the country with the peasants, where he had plenty of good things to eat, and here he used to overload his stomach.

As a boy the patient partook of hardly any meat
his fifth to his fourteenth year of age; his main
ment consisted of potatoes, flour-soup, bread,
soup only now and then; of meat he par-
en occasionally visiting his relatives. He
uttermilk or coffee.

As long as the patient can recollect he often brought up the food from the stomach into the mouth about half an hour after the meal, chewing it and swallowing it again. When eating cherries he was in the habit of swallowing the pits also, and afterward, when bringing them up from the stomach into the mouth, he used to spit them out.

This bringing up of the food the patient did mainly when feeling well. He enjoyed chewing the second time as much as when first masticating the food. Often the food would come up in morsels, although the patient had not been thinking of it at all. He hardly ever vomited, except when he got drunk—which happened twice during his life—and when crossing the ocean on a trip to Germany. He eats hastily, and the hard substances he chews well afterwards when they come up from the stomach.

The patient can ruminate any time he chooses, except when the stomach contains but very little or is almost empty. In ruminating he takes care to conceal the act from others; he speaks to no one about it, and even his wife is not aware of his habit.

Present Condition.—Strongly built man of short stature, is well nourished, with good panniculus adiposus; chest organs intact; stomach dilated; the lower margin extending to one finger's width above the navel. He has no complaints whatever, enjoys a good appetite, his bowels are regular, and he feels well in every respect. The only thing which strikes him as being abnormal, and for which he was treated for some time in Germany and afterward came to see me, is his coated tongue.

October 27th.—One hour after the test breakfast: Patient spontaneously brings up a small quantity of the contents of his stomach (about 20 c.c.). With the tube likewise only a small quantity can be obtained

The roll particles are not minutely minced and almost unchanged. HCl = 0; acidity = 2; rennet = 0; propeptone = 0; peptone = 0; erythrodextrin = 0.

Meltzer's swallowing sounds: Patient drinks water; at the first swallow a sound is heard immediately at the xyphoid process (*Durchspritzgeräusch*); at the second swallow (one to two minutes later) a sound is heard about eight seconds afterward (*Durchpressgeräusch*); at the third swallow the *Durchspritzgeräusch* is heard immediately; and ten seconds later the *Durchpressgeräusch*.

I had the opportunity of examining the patient for three months, and always found the stomach contents in the above-described condition, with the same result of chemical analysis.

The history of this case seems to indicate that the abnormal condition of the stomach developed in his early youth; for only at that time the patient had complaints, whereas later on he had no disease whatever. This would show clearly that achylia gastrica may exist forty years without endangering the vital functions of the organism.

The second group, namely, of those presenting gastric symptoms, comprises the greater number of cases. The symptoms consist of loss of appetite, of a sensation of fulness or pain in the epigastric and gastric regions, and of vomiting. Occasionally only one of these symptoms may be present, while in some cases the symptoms mentioned may appear alternately. Headaches are frequently met with, and constipation of a mild character is also more or less the rule.

The following may be considered as a typical case of this group:

Mrs. G——, aged about 45, has complained of her stomach for the last twelve years. She is almost always troubled after meals with pains in the gastric and epigastric regions. Appetite poor. Bowels inclined to be constipated. Vomiting appears very seldom. Patient had lost considerably in weight during the first years of her ailment; thereafter her weight remained stationary. In 1891 she visited Carlsbad, but her condition did not improve any.

Present Condition.—Patient of small stature and quite thin. Panniculus adiposus somewhat thin. Lips and cheeks of a pale color. Tongue not coated. Chest organs normal. Palpation of the abdomen reveals the absence of any tumor. The epigastric region is sensitive on pressure, but not exactly painful. A splashing sound can be produced to about three fingers' width below the navel. The urine does not contain either sugar or albumin.

October 27th, 1892.—Examination of the stomach one hour after Ewald's test breakfast: HCl = 0; lactic acid = 0; acidity = 6; rennet = 0; biuret reaction = 0; erythrodextrin = 0; sugar +. The quantity of the gastric contents is not large, and there is a very small amount of liquid. The bread particles are not minute. No mucus.

October 30th.—When fasting, stomach empty.

January 8th, 1893.—Examination of the stomach one hour after Ewald's test breakfast: HCl = 0; lactic acid = 0; acidity = 4; rennet = 0; pepsin = 0; biuret reaction = 0; erythrodextrin = 0; sugar +.

During the year 1893 several other examinations of the gastric contents were made, with the same analytical data as just mentioned.

The third group, without gastric symptoms but with intestinal disturbances, forms, according to my experience, at least one-fifth of all the cases of achylia gastrica. In this group there may be either no gastric disturbances whatever or very slight ones (as, for instance, occasionally slight pressure in the gastric region—or belching). The appetite is either normal or somewhat increased. The principal symptom in most of these cases is obstinate diarrhœa, or diarrhœa alternating with periods of constipation. Some of these cases present symptoms similar to those met with in diabetes: constant thirst, frequent micturition, extreme weakness, great loss of flesh; in some, however, these symptoms are less marked, or there may exist merely a feeling of weakness and lack of energy.

The following case is a good representative of this group.

Solomon S——, 57½ years of age, always enjoyed good health until August, 1892, when he had a severe attack of dysentery; he was confined to the bed for over three weeks and felt afterward extraordinarily weak. Since that time the patient has had attacks of severe diarrhœa (much mucus, sometimes blood in the passages) every two to three weeks. This diarrhœa used to alternate with constipation. From August to October, 1892, the patient lost forty pounds in weight. From that time on he felt weak and miserable and complained of thirst. This condition has since remained unchanged, and he complains at present principally of extreme weakness, of intense thirst, and of very weakening diarrhœal attacks.

Present Condition.—Color of lips and cheeks very pale, anæmic. Tongue furred with a whitish coat. Chest organs intact. The stomach extends to one finger's width below the navel. A splashing sound can be easily produced in the gastric region. There is nowhere any tumor. There are no sensitive spots discoverable in the abdomen. The knee reflex is present. The urine contains neither sugar nor albumin.

Patient was treated for some time, at first with injections into the bowel (tannic acid 2.0 to a quart of water once daily), thereafter with the administration of peptonate of iron. These means, however, failed to be of any benefit whatever; the tired feeling and weakness persisted, and the frequent attacks of diarrhœa likewise remained unchanged.

November 21st, 1894.—Examination of the stomach one hour after Ewald's test breakfast: HCl = 0; acidity = 2; lactic acid = 0; rennet = 0; pepsin = 0; biuret reaction = 0; erythrodextrin = 0; sugar +. Quantity of liquid very small; the bread particles not minute; no admixture of mucus.

November 23d.—When fasting, stomach empty. Achylia gastrica is diagnosticated, and the patient treated with intragastric faradization. The diet is arranged in such a manner that it does not contain very much meat, and is instead rich in food taken from the vegetable kingdom.

After two weeks of this treatment the sensation of weakness was no longer felt. Patient began to look better. His cheeks had a red color, the bowels were regular, and the troublesome sensation of thirst that formerly was so annoying disappeared.

December 17th.—Examination of the stomach one hour after Ewald's test breakfast: HCl = 0, of neutral reaction; biuret reaction = 0; rennet = 0; pepsin = 0; erythrodextrin = 0; sugar +. Small quantity of fluid; the bread particles not minute; no mucus.

Patient asserts that he feels well; he can walk great distances without feeling tired.

December 20th.—One and a half hours after the test breakfast: stomach empty.

December 31st.—Patient takes one glassful of milk; one hour afterward he takes a glassful of water, and his stomach is directly faradized for ten minutes. Then the gastric contents are obtained by means of a tube; they consist of uncurdled milk diluted with water and are of neutral reaction.

Patient was examined at various times in January and February, 1895, and there was always found a complete absence of gastric juice. The absorption of the stomach was examined by means of the potassium iodide test, and the iodine could be detected in the saliva after a lapse of eleven minutes. Patient's health was and has remained thus far in very good state; his appetite is fair, bowels regular, and stools well formed; no attacks of diarrhœa.

April 15th, 1895.—Patient has gained ten pounds in weight.

January, 1896.—Patient is in perfect health and has gained forty pounds in weight.

While the subjective complaints are thus of quite a manifold nature and may often be entirely absent, particularly as regards the stomach, the objective symptoms are always alike and show the following peculiarities. One to one and a half hours after Ewald's test breakfast: 1. The pieces of roll are not minutely minced and unchanged. 2. The reaction is very weakly acid or neutral, usually the acidity is 4. 3. Hydrochloric acid is not present. 4. Lactic acid is either absent or present in traces and can be discovered only after a thorough shaking with ether. 5. Neither propeptone nor peptone is present. 6. The tests for the pepsin and rennet[1] ferments give negative results. 7. The stomach contents do not smell bad, and do not otherwise give the appearance of decomposition. 8. Absence of mucus. 9. The quantity of liquid found in the stomach of these patients one hour after the test breakfast is remarkably small. Aside from the fluids soaked in and around the particles of bread there is hardly any liquid at all. The gastric contents thereby acquire a peculiar, characteristic appearance, and look different from what they do in other affections of the stomach.

The small amount of fluid in the gastric contents of patients with achylia may be explained in the following way: Besides the water (or tea) ingested into the stomach with the test meal, there is no addition of juice (or liquid) during the stay of food in this organ. As the more liquid chyme, as a rule, leaves the stomach quicker than the more solid substances, these latter alone will then, after a while (about one hour after Ewald's test breakfast), be found present.

The motor function of the stomach is as a rule not impaired or slackened; in some of the cases it is rather somewhat hastened (Solomon S——).

The absorption faculty of the stomach is, according to my experience, not in any way retarded.

Course.—This disease runs a very protracted course; cases in which the stomach resumes secretion after a cessation of several years are very rare. I have had only one case of this kind under observation. As a rule, the subjective symptoms can be greatly ameliorated or entirely removed by prolonged rational treatment, while the objective symptoms of achylia remain unchanged.

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[1] The rennet zymogen, however, may still be found present.

Diagnosis.—To arrive at a diagnosis of achylia gastrica repeated examinations of the gastric contents are required for the detection of the above-mentioned characteristic points.

The points of differential diagnosis between achylia gastrica and cancer of the stomach have been described under the latter affection (p. 283) and are therefore omitted.

Prognosis.—The prognosis of cases of achylia gastrica is good *quoad vitam*, a view which I have represented in several papers and which is now generally accepted by most writers. The small intestine perfectly replaces the digestive work of the stomach, and the organism is not only enabled to maintain its equilibrium but also to gain in weight.

Treatment.—Therapeutic measures will be indicated only in cases presenting subjective symptoms.

The treatment will have to be carried out in the two following directions: 1. To stimulate the mechanical action of the stomach. 2. To arrange the diet in such a way that the food is easily accessible for the intestinal digestion.

The first point is best achieved by stimulating the stomach, as by lavage and, principally, direct faradization of the organ. In some of the cases I have not employed any medicaments whatever, and in others I have administered condurango or nux vomica.

In reference to diet, it is of utmost importance to see that the food is broken into very minute particles or can be easily divided by chewing. For, on the one hand, all kinds of meat are in no way altered in the stomach and reach the intestine in the shape in which they entered the cardiac orifice; on the other hand, the starchy substances contained in the vegetable food cannot become converted into maltose so long as the albuminous membrane occluding them has not been opened.

In the stomach of these patients starch, as such, when accessible to the action of ptyalin, undergoes conversion into sugar very rapidly.

Vegetable food is, as a rule, here very well borne. Strained pea and bean soups may be highly recommended on account of their richness in albumin. Kumyss or matzoon, or sometimes bonny-clabber well beaten with a spoon, or plain milk with the addition of bread or crackers with butter, are highly advantageous. Meats are to be allowed only in small quantities, best well hashed and broiled, or the white part of chicken. Brain, sweetbread, fish, and raw oysters are very suitable. In the grave cases it is advantageous to administer meat powder[1] (two to three tablespoonfuls or even more, *pro die*, in soup or milk).

The usual beverages, as tea, coffee, cacao with milk and sugar, besides small quantities of beer or stout, may be allowed.

Outline of Diet in Achylia Gastrica.

		Calories.
8 A.M.:	oatmeal with cream, 150 gm., . . .	395
	cacao with milk, 200 gm., ...	135

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[1] Meat powder can be prepared in the following manner: Raw lean meat is cut into thin slices and dried on a glass plate on the stove for about two or three hours, then pounded in a mortar and ground twice in a coffee-mill.

		Calories.
	toasted bread, 60 gm.,	135
	butter, 20 gm.,	163
12 M.:	pea soup, 200 gm.,	190
	scraped meat (broiled) or fish, 100 gm.,	213
	baked or mashed potatoes, 50 gm.,	63
	spinach or turnips, 50 gm.,	82
	wheaten bread, 60 gm.,	135
	butter, 20 gm.,	163
6 P.M.:	two eggs (soft-boiled or scrambled),	160
	farina with milk, 200 gm.,	432
	wheaten bread, 60 gm.,	135
	butter, 20 gm.,	163
	tea, 200 gm. (milk, 30 gm.; sugar, 10 gm.),	60
9:30 P.M.:	kumyss, 200 gm.; crackers, 30 gm.; butter, 10 gm.; or, instead, a sandwich with cream cheese or caviar, or sardines and beer,	323
		2,947

Here also, as in all other chronic disturbances of the digestive tract, it will be of importance to pay attention not only to the quality but also to the quantity of food taken. And the greatest stress must be laid upon the injunction that a sufficient quantity of food is taken. It is always preferable to have the patient partake of too large a quantity, of food rather than too small a quantity, in consequence of which a condition of subnutrition is so often established.

When the intestine has adapted itself to the greater amount of work and the nutrition is maintained on a well-regulated basis, achylia gastrica need not cause any trouble whatever, and the patient may enjoy perfect euphoria.

CHAPTER XI.

FUNCTIONAL DISEASES WITH VARIABLE LESIONS.—*Continued.*

Ischochymia.

Definition.—An affection characterized by the constant presence of food in the stomach, even in the fasting state. There is always a retardation or retention of chyme in the organ.

General Remarks.—The term "clinical dilatation of the stomach," as is well known, is applied by the majority of authors to a condition in which there is stagnation of food in the stomach. Taken in its true sense, however, the word "dilatation of the stomach," or "ectasia ventriculi," refers merely to the dimensions of the organ. This explains the frequent misunderstandings caused by these expressions. Some speak of dilatation of the stomach as soon as the limits of this organ are found enlarged; others, however, only in those instances where there are found remnants of food in the morning in the fasting condition. Rosenbach,[1] therefore, suggested the term "motor insufficiency of the stomach," to designate that condition in which the transportation of food from the stomach into the small intestine is at fault. In an article recently published, Boas[2] expresses the opinion that the terms "dilatation of the stomach" and "ectasia ventriculi" should not be used at all, and suggests the term "gastric insufficiency of the first and second degrees" instead. The first degree corresponds to the atonic condition, the second to the stagnation of food. Although, like Boas, I am fully convinced of the importance of differentiating between cases of stagnation of food and those in which the transportation of the chyme is only slightly retarded, I do not, however, believe that we ought to discard the expression "dilatation of the stomach," or that the proposed term, "gastric insufficiency of the first and second degrees" is well selected.

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[1] Rosenbach: Volkmann's Sammlung klin. Vorträge, No. 153, 1878.

[2] Boas: Deutsche med. Wochenschr., 1894, No. 28, p. 576.

"Dilatation of the stomach" is a term applied to the condition of the volume of the stomach, and signifies an enlargement of its dimensions. Such conditions not only do exist, but are an every-day occurrence. There is, therefore, no reason for discarding the term "dilatation of the stomach." Whether this enlargement of the dimensions of the stomach has been due to physiological or pathological processes, or whether it creates abnormal conditions or not, will have to be investigated in every individual case.

The term "insufficiency" or "mechanical (motor) insufficiency of the stomach," signifying a retardation in the transportation of the food from the stomach into the intestine, appears to me ill chosen; for the word "insufficiency," or "mechanical insufficiency of the stomach," does not clearly point out the condition caused by the transportation of chyme from the stomach into the intestines. Moreover, the term "mechanical insufficiency of the stomach" means that the fault for the non-transportation of food lies in the stomach, which is not the case in most instances.

Analogous to the expression "ischuria," which signifies an abnormal collection or stagnation of urine in the bladder, without giving the cause of this condition, the word "ischochymia"[1] might be applied in order to designate an undue stagnation of chyme in the stomach.[2] Thus "ischochymia" will embody a complex of symptoms without stating the cause. The latter will have to be discovered and further determined in each case.

Symptomatology.—Ischochymia may last either a short period of time (a few days to one week) or it may become chronic or stationary.

Acute ischochymia is occasionally found as a result of an acute inflammatory process of the gastric mucosa in consequence of gross errors in diet and the like. Ischochymia, then, although quite rarely, may develop alarming symptoms and may even lead to a fatal issue. Several such instances have been reported under the heading of acute dilatation of the stomach by Hunter,[3] Fränkel,[4] and Boas,[5] the case of the latter author ending in recovery. Whether acute ischochymia is due to a paralysis of the gastric muscles, or whether it is caused by a spasmodic contraction of the pylorus, is as yet undecided. Probably both conditions exist. In these instances it appears that nothing passes from the stomach into the duodenum; anything which is taken in the way of food or drink collects in the stomach and distends it. The presence of gastric juice may still further increase the amount of liquid within the organ, and in this way aggravate the condition. The prolonged stagnation of chyme within the stomach gives rise to manifold processes of decomposition and fermentation. Vomiting usually occurs and brings temporary relief. The direct cause of an eventual fatal issue is quite difficult to state. It may be due to auto-intoxication or to some more direct injury to the vagus nerve.

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[1] Ischochymia, from ἰσχειν=detain, and χυμός=chyme.

[2] See Max Einhorn: "Diagnosis and Treatment of Stenosis of the Pylorus." Medical Record, January 19th, 1895.

[3] Hunter: Medical Record, 1889.

[4] A. Fränkel: Deutsche med. Wochenschr., 1894, No. 7.

[5] J. Boas: Deutsche med. Wochenschr., 1894, No. 8.

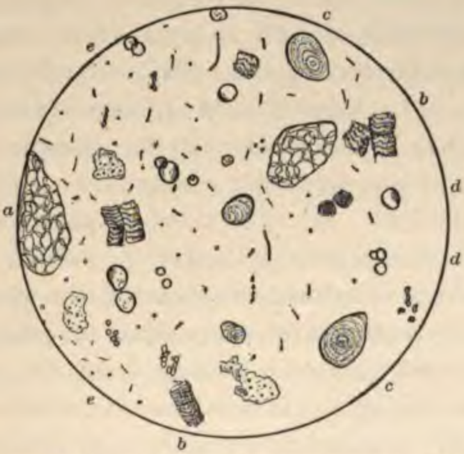

FIG. 49.—A Specimen of Chyme Obtained from the Stomach in the Fasting Condition (from a Patient with Ischochymia [H.]), showing (*a*) vegetable cells, (*b*) partly digested muscle fibres, (*c*) starch grains, (*d*) fat, (*e*) yeast cells, bacilli and cocci.

Transient ischochymia may appear in conditions in which the muscles of the stomach are weakened and fail to do their work properly, or in a beginning stenosis of the pylorus. In both instances the ischochymia is only slightly marked—that is, while there is a retention of some food in the stomach, the greater part is transferred into the small intestines. In the fasting condition the amount of chyme present in the stomach is not large. In a few days the stomach, as a rule, recuperates and by more energetic action succeeds in accomplishing its work properly, that is, transports all the chyme to the duodenum during the night.

Constant ischochymia is always a serious trouble. Processes of fermentation are almost constantly present (Fig. 49). It is here that the occurrence of manifold gases has been described; as, for instance, sulphuretted hydrogen, hydrogen, marsh gas, oxygen, and carbon dioxide. In some of these patients the gas eructated burns with a flame if lighted (Ewald). Very often it is possible to hear, when auscultating the gastric region of these patients, a constant bubbling or sizzling sound, arising from the rapid formation of the gas. If the gastric contents of such patients be obtained and put in a cylinder, one can perceive the bubbles of gas rising to the surface. The amount of gas may be determined, according to Kuhn,[1] by placing small quantities of the filtrate in a fermentation tube which is kept at blood temperature for several hours.

Chronic ischochymia is almost always accompanied by the following train of symptoms: The appetite is frequently poor, although at times it may be abnormally increased. The sensation of thirst is usually augmented and in some cases constantly present, and the patient is continually tormented with a feeling of extreme dryness in his throat. A feeling of oppression almost always exists, which at times may alternate with more or less intense pains. The eructation of gas, which has a disagreeable odor, is often met with. Vomiting of large quantities of chyme, in which particles of food from previous days may be recognized, is one of the most important symptoms. The vomiting may occur once or twice a day, or once only in two or three days. There are very few cases in which the bowels work regularly; as a rule, the most obstinate constipation is found. Emaciation is present in almost all instances, and it may occasionally reach such a degree that the patient literally looks like a skeleton.

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[1] Kuhn: Deutsche med. Wochenschr., 1892, Nos. 49 und 50.

In the advanced stages of ischochymia, the quantity of urine voided in twenty-four hours is greatly reduced, and may sometimes be less than 600 c.c.

Etiology.—Ischochymia is due to a diminished muscular work of the stomach, or to stenosis of the pylorus, or to an open ulcer within or very near the pylorus. In the latter instances a spasmodic contraction of the pylorus takes place.

Course.—The course of ischochymia will materially differ, according to the etiological factors causing this condition. Ischochymia due to muscular weakness of the organ (atony) may occasionally disappear without medical aid and is in most instances amenable to rational treatment. Ischochymia due to stenosis of the pylorus will run a different course, according to the nature of the stenosis. If the latter be of a benign type (hypertrophy of the pylorus or stricture of the pylorus due to cicatricial contraction) there are at first ameliorations which are due to an hypertrophy of the muscles of the stomach and to increased compensatory action; frequently, however, the symptoms of stenosis return as soon as the pylorus has become still narrower, until at last sufficient compensation cannot be effected. In this stage the only means of saving the life of the patient is surgical intervention in the way of establishing a larger opening between the stomach and the small intestines, which may be done either by Heinecke-Mikulicz' pyloroplasty or by a gastro-enterostomy.

In all these cases a radical cure can thus be accomplished. The patients then gain considerably in weight, have no pain, no digestive troubles whatever, and can attend to their daily vocations in life. They all feel as if "new-born," if I may be permitted to use this expression. In two of these patients I convinced myself, by means of several experiments, of the prompt forwarding of the contents of the stomach into the intestines. The chemical condition was not markedly changed; the gastric volume in the two patients was not appreciably lessened six months after the operation. In one of my newly observed cases,[1] however, there was a marked diminution in the size of the stomach two months after the gastro-enterostomy. If the stenosis is of a malignant type, then the course will correspond to the original disease. However, it is here also possible to relieve the symptoms of ischochymia by an early gastro-enterostomy.

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[1] Max Einhorn: "A Further Contribution to our Knowledge of Ischochymia." Medical Record, June 19th, 1897.

Before taking up the diagnosis, we may consider some symptoms which are characteristic of the just-mentioned etiological factors:

Ischochymia due to Atony.—In this condition the residue of chyme found in the stomach in the fasting state consists of some liquid and fine particles of food. Even if coarse particles of food (as, for instance, asparagus, spinach, rice grains not too well cooked, chestnuts, and the like) have been ingested on the previous day, the residue of these substances is not so very much pronounced, while in ischochymia due to stenosis of the pylorus it will be found that the entire quantity of such coarse particles of food, which undergo no changes in the stomach, will remain within the organ. In atony of the stomach the difficulty merely lies in a deficient peristalsis of the stomach, *i.e.*, the contents are not sufficiently pushed toward the pylorus. But whatever reaches this outlet can pass without much inconvenience, whether it be very fine or whether coarser particles be present. This is quite different in stenosis of the pylorus, for here the main obstacle is the narrowness of the canal, which does not permit of the passage of coarser particles of food. The peristalsis of the stomach, even if the muscles work with increased activity, is here without much avail.

As cases of ischochymia due to a weakened condition of the muscular action of the stomach are quite rare, the following case, which I have observed very recently, will not be without interest:

Patient H——, aged 46 years, had been suffering for the last three years with an intense burning sensation, beginning at the pit of the stomach and extending all the way up through the œsophagus to the pharynx. There was a feeling of pressure in the gastric region, which occasionally alternated with pains. Besides, the patient complained of belching of bad-smelling gases, which were very disagreeable, especially to his wife and immediate family. His appetite was fair, and constipation existed only in a slight degree. His weight had steadily decreased during the last three years, so that he had lost over fifty pounds within that period. The examination of the patient revealed that the stomach was quite enlarged; a splashing sound extended to about two fingers' width below the navel, and a succussion sound could be easily produced. The examination of the stomach in the fasting condition revealed the presence of a considerable quantity of chyme, which presented all the signs of marked decomposition (almost fetid odor, presence of sulphuretted hydrogen; microscopically, each specimen was full of micro-organisms, yeast cells, and sarcinæ); free hydrochloric acid, however, was present in quite normal amounts. After a thorough cleansing of the organ, the patient was told to partake of light (more liquid) food during the day, and for supper of some meat, a liberal amount of rice, not too well cooked, and some bread.

On the following morning the patient was again examined in the fasting condition. While some chyme was present in the stomach, the amount of rice found was very small indeed, so that it was rather difficult to recognize its presence with certainty. The result of this observation, combined with the points derived from the history of the disease (the symptoms steadily keeping on and slowly gaining in severity, no decided free intermissions of long duration), seemed to point to an atonic state of the gastric muscles, rather than to stenosis of the pylorus. The beneficial results of the treatment, which was based on this view (regulation of diet, four or five meals daily, interdiction of larger amounts of liquids, large doses of bismuth, with the addition of small doses of resorcin, and occasional lavage of the stomach), justified the conclusion that the diagnosis was correct. The patient after a few weeks felt much better, lost his burning sensation, while the stomach in the fasting condition was now found empty, and only after the ingestion of a very large supper the stomach on the following morning contained a small quantity of chyme, but not smelling badly. After three months the patient had gained twelve pounds in weight, and is steadily improving.

Benign Stenosis of the Pylorus.—Only rarely can the pylorus be palpated as a small oval tumor (of small hen's egg size); in most instances the pylorus cannot be felt. All cases reveal a long period of sickness (extending from two to fifteen years), in which the appearance of pain plays the greatest part. Although at first, either with or without therapeutic aid, there appear ameliorations, these periods of euphoria, however, are again and again interrupted by fresh attacks of sickness. They constantly become more violent and of longer duration, and the pains subside only after an artificially induced or spontaneous vomiting spell. Still later, when the ischochymia develops to a higher degree, not even vomiting brings entire relief, and the patients are subjected to the greatest pain and suffering. They emaciate quickly, and, if there is no radical intervention at this period, death from starvation inevitably eventuates.

The following two cases present good instances of a benign stenosis of the pylorus:

CASE I.—Louis L——, 40 years of age, lawyer, began to be troubled with his stomach in the summer of 1891. The patient was attacked with pains after meals during a period of ten days, when this symptom

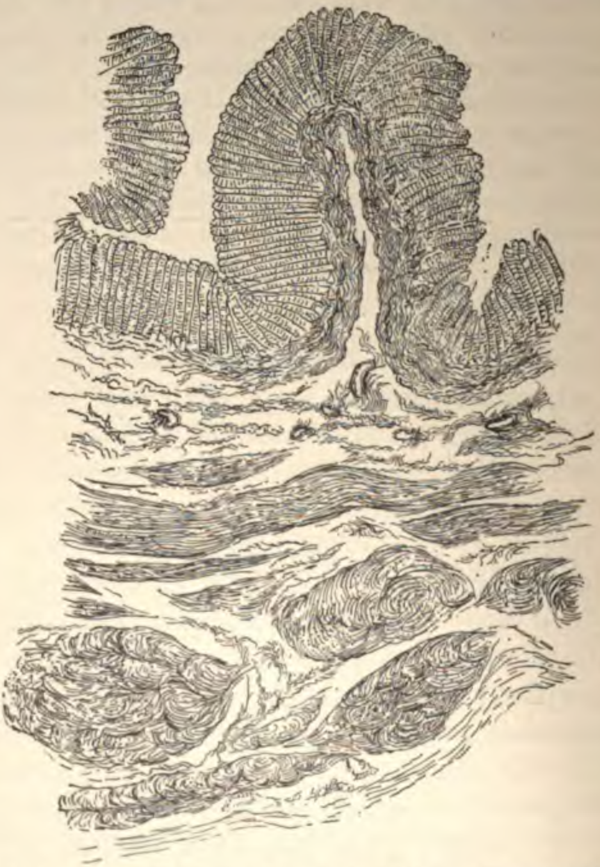

FIG. 50.—Cross-section of a Benign Hypertrophied Pylorus. (From the writer's own observation.) × 60.

disappeared suddenly. There was no vomiting. For six months the patient felt well, not having any pains whatever; he noticed, however, that he became tired quicker than heretofore. In the winter of 1892 (February) he again had an attack of pain, lasting more than a month. During this attack he vomited twice. He felt well until July, when he had a fresh attack of pain extending over two to three weeks, with four vomiting spells. On account of the severe pains he could not lie quietly, but had to walk frequently to and fro in his room. In December, 1892, the patient had another attack, lasting until February, 1893. He then had to vomit frequently (nearly every other day). He had never vomited any blood. Since the beginning of the sickness his bowels were constipated.

On January 27th, 1893, Dr. Charles Simmons called me in for a consultation and kindly entrusted me with the treatment of the patient.

When I first saw the patient he presented the picture of a very sick man in agonies of pain. He looked pale and emaciated; he asserted that he had lost about forty pounds in weight since the beginning of his ailment, and complained of a feeling of constriction in the abdomen and of shortness in breathing; he further complained of vomiting large quantities of fluid, and of obstinate constipation. During the last fourteen days the patient had taken large doses of opium; he was, however, very rarely entirely free from pain.

The examination of the chest organs did not reveal anything abnormal. Tongue slightly coated; pulse, 90; temperature, 98° F. The whole abdomen was more or less bloated and quite tense. In the gastric region no splashing sound could be produced. No tumor could be felt. The fluid which the patient vomited a few hours before showed many blackish flakes floating in it, contained a great quantity of free HCl, gave no reaction for lactic acid, and had an acidity = 90.

Patient was instructed to have a light meal (well-scraped meat, oysters, milk, crackers) every two hours. The quantity of liquids was reduced, and he was allowed to take only 150 c.c. at a time. Besides, oil clysmata were administered. Under this treatment the patient felt somewhat better, although his ailment, on the whole, did not change. On January 29th he was instructed not to take any food after his eight o'clock evening meal until the next morning. On January 30th, at 8 A.M., when fasting, the tube was inserted into the stomach and two quarts of liquid withdrawn. The stomach was then washed with lukewarm water. Patient felt exceedingly well after this lavage.

The withdrawn gastric liquid was analyzed; in this sample there were the blackish flakes mentioned above. The examination showed: HCl +; acidity = 88; lactic acid not present; peptone +; propeptone +; rennet and pepsin +; erythrodextrin +.

Microscopically, no particles of meat can be found; amylaceous grains, yeast cells, and bacteria are present in considerable quantity. Teichmann's test for blood shows the absence of hæmin.

Thus the withdrawn liquid consisted principally of gastric juice and of remnants of food taken the previous day.

February 1st, 1893, at 10 P.M., the stomach of the patient was thoroughly washed out. During the night he did not partake of anything, and on February 2d, at 8 A.M., the stomach was examined with the tube, and a small quantity of liquid withdrawn (150 c.c.). The examination of this gastric liquid showed: HCl + : both ferments present; acidity = 70.

The patient was treated with lavage for another week. He felt better and could walk outdoors. The pains, however, persisted, although they were less severe, and the stomach was never empty in the morning, but contained more or less liquid with food remnants.

February 11th, 13th, and 15th.—Intragastric galvanization was applied without, however, materially improving the patient's condition. The diagnosis of benign stenosis of the pylorus was made and an operation strongly recommended.

Dr. F. Lange undertook the operation on February 22d. The pylorus was found greatly constricted. Heinecke-Mikulicz's pyloroplasty was performed, and after a month's confinement the patient left the clinic. Although he was now able to partake of a more varied and coarse diet without vomiting, he nevertheless constantly complained of pains and had to resort to opium.

On March 30th the stomach was examined one hour after the test breakfast: HCl + ; no lactic acid; acidity = 120, no remnants of food from the previous day. It was supposed that this high degree of acidity might be the cause of the pains. The patient was therefore instructed to take half a teaspoonful of bicarbonate of soda three times a day, two hours after meals. This worked like a charm; the pains entirely disappeared and he began to gain rapidly in flesh After six months' medication with the soda the patient discontinued its use and felt perfectly well without it. He now attends to his business and has gained seventy pounds since the operation.

Case II.—Mrs. P. L——, 43 years of age, mother of three children. Her mother died of cancer. Patient has been suffering for six years. The ailment began with diarrhœal trouble lasting for two years.

(Patient is unable to state whether the stools were of dark color.) Since four years cramps in the stomach. The pains are extremely severe; there is relief after belching or flatus. Never had any jaundice. For the last two years intense burning in the stomach with frequent vomiting. Never vomited any blood. During the night the pains are extremely severe and disturb sleep. Patient during last months lost considerably in weight (about thirty pounds). She was referred to me by Dr. Willy Meyer for examination and diagnosis.

Present Condition.—Chest organs intact. Palpation of the abdomen reveals a small cylindrical tumor, of the size of an egg, situated to the right of the navel. This tumor is easily movable in all directions and has a smooth surface. A splashing sound can be produced in the gastric region from one to two fingers' width below the navel. The gastric region is not painful to pressure. The liver is not enlarged.

After lavage the patient is examined with the gastrodiaphane; the stomach is found considerably enlarged and occupying a low position.

On the following day the patient is examined with the tube one hour after a cup of tea without bread (the patient being in the fasting condition with the exception of the tea). The stomach contained about 300 c.c. of a slightly greenish liquid (presence of bile), in which were only a few remnants of food (several bread particles) from the previous day. The analysis showed: HCl +; acidity = 42; free HCl = 24; lactic acid = 0.

The patient was then treated for a week with lavage and chloral hydrate at the New York Post-Graduate Hospital; there was, however, no material improvement in her condition.

On a subsequent examination one and one-half hours after Ewald's test breakfast: HCl+; acidity = 50; no lactic acid. The obtained gastric contents amounted from 300 to 400 c.c. and contained food from previous days; for instance, rice, which had been taken on the previous night, and several grape-skins, which had been taken three days before. This time no bile could be detected.

The diagnosis (of benign stenosis of the pylorus) was made and the patient operated on by Dr. Willy Meyer.[1] After opening the abdomen the tumor, which proved to be the thickened pylorus, was resected. The duodenum was then inserted into the stomach by means of Murphy's button. The patient passed an undisturbed convalescence, evacuated the button in her stools during the third week, and has since been well. She has gained twenty pounds and has had no pains whatever.

The resected, highly thickened, and stiff pylorus could not be macroscopically distinguished from a cancerous organ; the microscopical examination, however, showed that it was merely an hypertrophied pylorus.[2]

Malignant Stenosis of the Pylorus or Cancerous Stenosis.—Stenosis of the pylorus due to carcinoma is of frequent occurrence, and is developed sooner or later in the course of most cancers of the stomach appertaining to this region. Cases in which the diagnosis is made at an early period are most suitable for surgical interference. When possible, the tumor should be resected; otherwise gastro-enterostomy should be performed. An operation appears to me to be always indicated when there exists ischochymia for some time, and either a tumor is felt or else the diagnosis of cancer of the pylorus can be made by other deductions—unless the tumor has assumed too extensive dimensions or the patient be too weak to stand an operation. Assuredly one can in many cases give great benefit for a more or less prolonged period of time, and the sooner the greater. Of the considerable number of cases of cancerous stenosis of the pylorus which I have seen during the past five years, eight have been operated upon. In only one was resection of the pylorus practised; in all others gastro-enterostomy was performed by well-known surgeons of this city. One patient died during the first week after the operation. The remaining seven lived from two months to a year.

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[1] Heinecke-Mikulicz's operation could not be done in this case: (1) on account of suspicion of cancer; (2) because the lumen was too narrow and the thickening of the walls of the pylorus too considerable.

[2] The wall of the pylorus, after specimen was preserved in alcohol for about nine months, measured in thickness 1½ cm.

All cases of cancerous stenosis reveal a more or less short period of illness[1](five months to one and a half years at the utmost) and show considerable ischochymia. In most instances, with but few exceptions, a gastric tumor can be palpated. In some of the cases the position of the tumor can be accurately determined with the gastrodiaphane. By means of transillumination, it can be ascertained whether the tumor occupies the greater or lesser curvature of the stomach. I append the drawings of two cases as viewed with the aid of the gastrodiaphane (Figs. 51 and 52). Both patients had been operated on by Dr.

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[1] There are, however, exceptions to this rule. Thus a cancer which has developed on the basis of an ulcer may give a long period of disease.

F. Kammerer, at the German Hospital, and the diagnosis as to position of the tumor was found to be correct. Most cases show the absence of free HCl and the presence of lactic acid, although in some instances free HCl is present in considerable quantities and lactic acid absent, as the following case demonstrates:

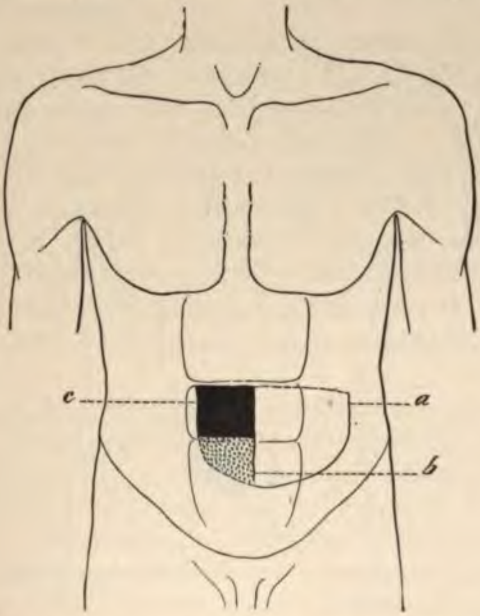

FIG. 51.—Result of Gastrodiaphany in Patient K. N——, with Tumor in the Gastric Region. *a*, The transilluminated zone; *b*, the dotted spot slightly translucent on pressure; *c*, the black-colored spot remains dark even on pressure.

March 9th, 1894.—Oscar F——, 32 years of age, silk manufacturer, always robust and healthy, has been suffering for the past six or seven months from digestive troubles which have been constantly increasing. They consist principally of pain, and for the last four months also of frequent spells of vomiting. Patient has lost forty pounds in weight. Bowels not materially impaired. Poor appetite. Patient has never vomited any blood.

Present Condition.—Patient looks thin and cachectic. Lips and cheeks are extremely pale. Chest organs intact. Palpation of the abdomen shows painfulness on pressure in the gastric region and an egg-sized tumor somewhat to the right and above the navel. This tumor is not especially painful on pressure, presents a smooth surface, and is easily movable. A splashing sound can be produced in the gastric region extending to two fingers' width above the symphysis.

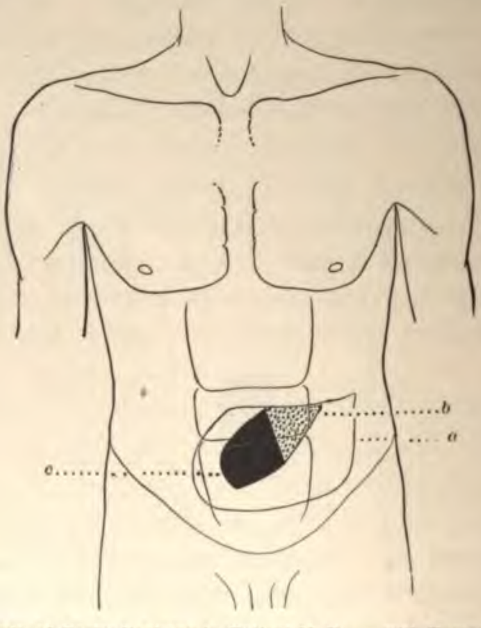

FIG. 52.—Result of Gastrodiaphany in Patient M. R——, with Tumor in the Gastric Region. *a*, The transilluminated zone; *b*, the dotted spot slightly translucent on pressure; *c*, the black-colored spot remains dark even on pressure.

March 9th, at 6 P.M.—Patient had taken a glassful of milk at 10 A.M. and had had nothing since; it was therefore eight hours after his last meal. Examination by means of the tube revealed the presence of two pints of chyme. The latter showed a brownish color, contained small particles of casein, and various other food-stuffs. HCl +; no lactic acid; acidity = 118; free HCl = 94.

Patient is instructed to take with his supper rice, milk, and crackers.

March 10th.—When fasting, two pints of chyme are withdrawn from the stomach. The chyme presents a brownish color and contains food from previous days—rice, particles of bread, and casein. Microscopically: yeast cells, granules of starch, sarcinæ, bacteria, brown pigment. Chemically: HCl +; no lactic acid; acidity = 112; peptone +; propeptone +; rennet +; erythrodextrin + little; achroödextrin + much.

March 12th.—The stomach is examined in the fasting condition and the same results are obtained as on the 10th.

The high degree of ischochymia and the presence of a tumor in the pyloric region pointed with certainty to a stenosis of the pylorus. It was questionable, however, whether the process was a benign or a malignant one. Whereas the chemical condition of the gastric contents pointed toward a benign stenosis, the large size of the tumor and the relatively short period of sickness (six to seven months) answered more to the history of a malignant growth.

After a consultation with Dr. F. Lange, we both were of the opinion that we had to deal here with a cancerous stenosis of the pylorus. The high degree of ischochymia appeared to necessitate surgical interference, which should consist in either resection of the pylorus or in gastro-enterostomy.

Patient was operated on by Dr. Lange, on March 16th, 1894; the tumor was found (macroscopically) to be a cancer, and could not be resected on account of the numerous adhesions, principally with the colon. Gastro-enterostomy was established, and in about a month's time patient was able to leave the clinic and partake of a great variety of food. Soon, however, regurgitation of bile into the stomach appeared, and a short while afterward "peristaltic restlessness" of this organ also developed. Both conditions made the patient feel very uneasy.

April 19th.—Patient was examined one hour after Ewald's test breakfast. There was a considerable amount of bile in the gastric contents, which did not contain any food from the previous day. Chemically: $HCl = 0$; no lactic acid; acidity = 22.

Diagnosis.—In cases of ischochymia due to stenosis of the pylorus, benign as well as malignant, symptoms of vomiting[1] and pain are almost always present, in connection with a more or less considerable loss of weight. This condition, however, is best recognized by the examination of the stomach by means of the tube when fasting. I usually instruct the patient to have at his supper, on the night preceding the examination, besides soup, meat, and bread, some rice, as this latter is very easily recognized and as a rule is retained in the stomach when the pylorus is stenosed. For this examination the expression method alone is not always sufficient. Whenever no chyme is withdrawn by this method, it is necessary to wash out the stomach. In these cases food is then continually found in the stomach. Dilatation of the stomach is almost always present; the organ occasionally extends from the margin of the ribs far down to the symphysis.

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[1] Vomiting may sometimes be absent, notwithstanding that ischochymia has already developed. I at present have under observation a patient with carcinoma pylori (with clearly palpable tumor), who has been ailing for the last six months. The patient has never vomited nor has he had much pain. His complaints merely refer to loss of appetite and obstinate constipation. The examination of the stomach in the fasting condition always reveals the presence of chyme (coarse food-stuffs are principally found). Although the patient, living on a more regulated diet, has gained six pounds within the last month, nevertheless the ischochymia remained unchanged.

DIFFERENTIAL DIAGNOSTIC POINTS.

	Benign stenosis of pylorus.	Malignant stenosis of pylorus.
Duration of illness.	Long duration of illness (two to fifteen years).	Short duration of illness (five months to one and one-half years).
Course of the disease.	Long intervals without pain, or periods of perfect euphoria.	No periods of perfect euphoria, but constant and gradual aggravation of the symptoms.
Tumor	As a rule absent........	Present in most cases.

CONDITION OF GASTRIC CONTENTS.

	Benign stenosis of pylorus.	Malignant stenosis of pylorus.
Free HCl........	Present in the great majority of cases.	Nearly always absent.
Lactic acid......	Absent in the great majority of cases.	As a rule, present.
Acidity	Always increased.......	Fluctuates between 30 and 90.
Rennet..........	Always present.........	Varies.
Odor............	Unpleasant, disagreeable	Very frequently fetid.

In the following I shall describe several symptoms which, when present, are very valuable, but whose absence does not militate against the existence of pyloric stenosis. These symptoms are:

1. The dilated or abnormally large stomach.
2. The thickened and readily palpable pylorus.

3. The peristaltic restlessness of the stomach.

4. The fermentation products.

1. The abnormal size of the stomach is pathognomonic only if the organ occupies nearly the entire lower section of the abdomen, and contains over three or four litres of fluid. Such stomachs are frequently met with in old cases of stenosis of the pylorus, and their presence at once awakens the suspicion of a narrowing of the pylorus; before this diagnosis can be made, however, the presence of ischochymia must be determined. In this country considerable weight has been placed upon this symptom; yet the absence of this diagnostic sign should not lead us astray, for it is our aim to make the diagnosis of pyloric stenosis as early as possible, while the pronounced, at once perceptible dilatation of the stomach develops only in the course of time.

2. If it is possible by means of palpation to map out the pylorus as a smooth, oval tumor, and if ischochymia is present and the disease has lasted over one and a half or two years, we can with certainty make a diagnosis of benign pyloric stenosis.

3. Peristaltic restlessness of the stomach is frequently found in cases of benign as well as of malignant stenosis of the pylorus. Inasmuch as the peristaltic restlessness of the stomach but very rarely occurs as a pure neurosis, this symptom is of great significance for the recognition of stricture of the pylorus, the more so as an examination for this purpose (simple inspection of the abdomen in the recumbent position) is not attended with any difficulty.

The presence of this symptom in connection with the existence of ischochymia speaks in favor of narrowing of the pylorus, and against simple relaxation of the gastric muscular coat; the absence of this symptom is of no consequence.

4. Fermentation products (formation of lactic acid or gases in the stomach) are observed almost constantly in all cases of ischochymia. Commonly, one or the other kind of fermentation is present, that is, either formation of lactic acid or formation of gases. The lactic acid is found in the stomach in cases in which the secretion of hydrochloric acid is considerably diminished, while the development of gas is encountered in cases in which there is an abundant secretion of gastric juice. These points, which have been especially emphasized by H. Strauss,[1] I can completely confirm on the ground of my own experience.

These fermentation products may be absent, however, notwithstanding the presence of pyloric stenosis, if the stomach has been treated in a rational manner, that is, has been washed out several times.

The constant or frequent occurrence of small quantities of bile in the stomach does not in my experience militate against the existence of a narrowing of the pylorus; on the other hand, it appears to me to point to a firm rigidity of this orifice, in consequence of which the latter is never completely closed.[2]

Among the more recent auxiliary measures which are available in arriving at a diagnosis, the gastroscope has been recently employed by Rosenheim and Kelling. In my opinion there is no doubt that this instrument has a great future, although at present it has not been generally utilized.

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[1] H. Strauss: Zeitchr. f. klin. Medicin, 1895.

[2] Max Einhorn: "A Further Contribution to Our Knowledge of Ischochymia," *l. c.*

A protracted atony of the stomach may at times produce ischochymia; it is then, however, not constantly found and disappears soon after the regulation of diet and rational treatment. The same may be said of grave forms of chronic gastric catarrh. Here also ischochymia is liable to develop under favorable conditions. The symptom, however, disappears after a few washings of the stomach. In this way I believe that these two conditions (atony of the stomach and chronic gastric catarrh) can be distinguished without difficulty from stenosis of the pylorus, and can give no cause whatever for mistakes.

Treatment.—In the treatment of ischochymia it is necessary, first of all, to ascertain the cause of the stagnation of food in the stomach.

If this be due to a far-advanced stenosis of the pylorus, or to a commencing occlusion of this opening malignant in its nature, surgical interference (pyloroplastic operation, pylorectomy, or gastro-enterostomy) is indicated. If we have to deal, however, with commencing benign stenosis of the pylorus, or a genuine relaxation of the muscular coat of the stomach, palliative treatment should first be given a trial, and in the event of its failure an operation is demanded.

The palliative treatment in the milder cases consists in the employment of a fluid or semifluid diet (milk soups, with finely ground farina, meat broths with egg, egg and milk) lavage of the stomach in fasting condition, followed by spraying with a one-per-mille solution of nitrate of silver, and in the administration of medicaments which prevent fermentation. Among these may be used benzonaphthol, salol, bismuth, and resorcin. I frequently give:

℞ Resorcin	4.0
Bismuth. subnit	20.0
Aq. dest	200.0

S. One tablespoonful in a wineglassful of water three times daily, half an hour before meals.

In severe cases (frequent vomiting, violent pains, intense burning sensations) it is advisable to keep the patients in bed for about three weeks, and to nourish them for five days exclusively per rectum (besides the nourishing enema rectal injections of water, as recommended by Unverricht, are of great benefit when thirst is present and the amount of urine decreased) and then slowly and gradually adopt a milk diet, as in ulcer of the stomach—in this condition, however, much more cautiously and slowly.

Thus, for example, on the sixth day I give only two tablespoonfuls of milk every hour, on the seventh day three tablespoonfuls, on the eighth day four tablespoonfuls, etc., until I have reached 100 c.c. every hour; then I give 200 c.c. every two hours, and increase to 300 c.c. On every other morning I determine by washing out the stomach in the fasting condition whether it is empty.

In this manner it is frequently possible to adapt the stomach, first to a light, and later to a heavier diet. The patients then increase gradually in weight and appear completely well. Yet they cannot be regarded as entirely healthy, because we must be constantly prepared for a recurrence of the old affection.

Moreover, in cases in which it is not possible to remove the ischochymia by palliative measures, the patient may sometimes maintain a comfortable existence under use of regular washings out of the stomach and the maintenance of a light and rather fluid diet. Such patients, however, are menaced by many dangers and can enjoy but few of the luxuries of life, and for this reason the clinician should insist that an operation is to be regarded as the only correct procedure.

In benign stenosis of the pylorus the application of massage (ten minutes twice daily) to the gastric region can be warmly recommended. Likewise the administration of alkalies in existing hyperacidity, and the application .of the galvanic current when there are severe pains may be profitably tried.

Cancerous stenosis of the pylorus hardly admits of any treatment. Condurango given when there is anorexia, and chloral hydrate (a tablespoonful of a three-per-cent solution every two to three hours) when pains exist, as has been recommended by Ewald, are the most reliable and efficient medicaments.

In ischochymia due to atony of the gastric muscles the treatment should consist of lavage, direct faradization of the stomach, and the administration of frequent but light meals.

Complications.

Tetany.—The occurrence of tonic and clonic spasms in the flexors of the arms, in the muscles of the calf, and in the muscles of the abdomen as a complication [illegible] the stomach" (ischochymia) was first pointed out by E. Neumann[1] and shortly afterward by Kussmaul.[2] Frequently the muscles of the face, of the jaws, and of the neck are likewise affected by the spasmodic contractions. The eyes are turned upward and occasionally emprosthotonus of short duration occurs. The crampy contractions are painful; consciousness is either undisturbed, partly disturbed, or entirely absent. In one of Kussmaul's cases, which was published by Gassner,[3] the attacks had a distinctly epileptiform character. Several cases of this complication, which have been described mostly under the name of tetany, have been published by Leven,[4] Dujardin Beaumetz,[5] Hanot, Müller,[6] Gerhardt,[7] Renvers,[8] Bouveret and Devic,[9] Ewald,[10] Albu,[11] Boas,[12] and Fleiner.[13] Real tetany is characterized by the sudden appearance of mostly bilateral tonic contractions of the muscles, beginning at the fingers and toes and progressing thence centripetally. The flexor muscles are principally affected, and the hand usually assumes a position which has been characterized by Trousseau as the obstetrical hand. Only in rare instances are the extensor muscles also affected. As a rule, the knees are bent and the toes turned downward, while the heel is turned upward and somewhat outward (pes equinus). The muscles of the femur and the thigh are only very rarely involved. The duration of the attacks may vary from five minutes to several hours. The following symptoms, which exist for some time after the attacks, are characteristic of tetany:

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[1] E. Neumann: Deutsche Klinik, 1861.

[2] Kussmaul: Deutsch. Arch. f. klin. Med., 1869, Bd. vi.

[3] Gassner: Inaug. Dissert., Strassburg, 1878.

[4] Leven: Gaz. méd. de Paris, 1881, p. 646.

[5] Dujardin Beaumetz: L'Union médic., 1884, Nos. 15 and 18.

[6] Müller: Charité Annalen, Bd. 13, 1886.

[7] Gerhardt: Berl. klin. Wochenschr., 1886, No. 36, and 1888, No. 4.

[8] Renvers: Gesellschaft der Charité Aerzte, 1887.

[9] Bouveret et Devic: Rev. de médecine, 1892, p. 48.

[10] Ewald: Berl. klin. Wochenschr., 1894, No. 2.

[11] Albu: Berl. klin. Wochenschr., 1894, No. 2.

[12] Boas: *loc. cit.*, 107.

[13] Fleiner: Arch. f. Verdauungskrank., Bd. i., Heft 3.

1. Compression of the main nerves or blood-vessels of the affected extremities for one to two minutes will produce an attack (Trousseau); 2. The electrical irritability of the nerves and muscles is greatly increased (Erb); 3. The mechanical irritability of many nerves of the extremities, and especially of the facialis, is increased. Tapping with a finger in the region of the facial nerve produces quick contractions of the corresponding muscles. Kneading of the face from top to bottom evokes contractions of the subjacent muscles (Chvostek).

The *prognosis* of tetany is quite bad. In the cases collected by Bouveret and Devic there was a mortality of seventy per cent.

It seems that this complication is of quite rare occurrence, for all the cases mentioned in literature scarcely exceed thirty. Tetany-like convulsions and epileptiform attacks with loss of consciousness are met with far more frequently. According to my experience, the latter complications occur not only in cases of chronic ischochymia, but also in other affections of the stomach.

Thus I have observed one case in a man, 28 years old, who suffered for a great many years from a chronic gastric catarrh. In August, 1895, during a hot spell, he was obliged to drink large quantities of ice-water. At that time he began to suffer from attacks of tetany, alternating with epileptiform convulsions and loss of consciousness. During an attack of tetany the patient would notice that his arms and legs became contracted against his will and would remain in this condition for about ten minutes, he being perfectly conscious, but unable to change the assumed position of the affected extremities.

The epileptiform attacks would begin with a premonitory stage of pain in the gastric region and a restless condition which would last only a short while. Thereupon the patient would lose his consciousness entirely and convulsions of all the muscles in the body would ensue. He would remain in this state from twenty to forty minutes, would frequently bite his tongue, and after awakening usually had no idea of what had happened. The patient had such attacks of either tetany or epileptiform convulsions once or twice a week, and felt utterly prostrated for a day or two after their occurrence. He also complained of a very disagreeable taste in the mouth between the attacks. On examining the stomach in the fasting condition, I found that it was perfectly empty. One hour after a test breakfast free hydrochloric acid was present, but the degree of acidity was somewhat diminished. Under lavage and a general tonic treatment, the patient's condition improved and the attacks became milder in form and appeared at much longer intervals; thus for a period of six weeks the patient had no attacks whatever. The attacks sometimes occurred without any apparent cause, sometimes, however, they could be referred to some gross dietetic error;

thus, for instance, the patient once took a very large piece of salted herring with bread and cheese at twelve o'clock at night before retiring. He awoke at two and called his brother, who slept in the adjoining room, telling him of his restless condition and of the painful sensation within his stomach, and a few minutes later was seized with a severe convulsive attack, which lasted for half an hour, and during which he again severely bit his tongue.

I have observed a similar case of epileptiform attacks in which there was likewise no ischochymia, but hyperchlorhydria and erosions of the stomach. In this case, however, the attacks, as a rule, appeared after an accidental overloading of the stomach, alcoholic drinks apparently playing a great part therein. In a third case I likewise noticed epileptiform attacks in a lady of forty years of age, who suffered from chronic ischochymia, due to a benignant stenosis of the pylorus.

The prognosis of these epileptiform attacks seems to be far more favorable than that of real tetany, for in none of the three cases mentioned have the attacks thus far resulted in a fatal issue.

With regard to the *etiology* of either tetany or the epileptiform attacks accompanying severe gastric disorders, three theories have been expounded: 1. One theory has been given by Kussmaul, explaining the symptoms of tetany and similar conditions by the great loss of fluids to which the system has been subjected, for this condition is most frequently found in patients who have vomited for a long time and in this way lost a great deal of liquid, in consequence of which the blood has been much thickened, while the nerves and all other tissues have become thoroughly dry. The thirst which is met with in these patients and the greatly diminished urinary excretion speak in favor of this view. This theory has lately gained a warm supporter in Fleiner, who pointed out that in most of these conditions of stenosis of the pylorus, besides the slight quantity of liquid which is able to pass from the stomach into the small intestines, there is often a state of hypersecretion, owing to which abundant quantities of gastric juice are poured into its cavity. The latter circumstance increases the great deficiency of water in the system.

2. The second theory, advanced by Germain Sée,[1] explains these tonic and clonic convulsions as a reflex action from the nerves of the stomach. Friedrich Müller is also in favor of this view, for the two following reasons: First, tetany is occasionally met with in cases in which there is no considerable loss of fluid, as for instance in cases of intestinal worms. Secondly, Müller was able to produce such an attack of tetany in one of his patients by striking his epigastrium.

3. The third theory explains tetany and similar conditions on the basis of auto-intoxication. In cases of ischochymia, many processes of fermentation and decomposition exist, and these give rise to the production of toxic elements, which are liable to give rise to the above-described symptoms. Gerhardt, Baginski,[2] Paliard,[3] Loeb,[4] Bouveret and Devic, Ewald, Heim,[5]

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[1] Germain Sée: Bull. de l'Acad. de méd., 1888.

[2] Baginski: Arch. f. Kinderheilk., Bd. vii., 1886.

[3] Paliard: Rev. de médic., 1888, p. 406.

[4] Loeb: Deutsch. Arch. f. klin. Med., Bd. 46, p. 98.

[5] Heim: Inaug. Diss., Bonn, 1893.

Albu, Schlesinger,[1] and Kulneff[2] are all firm believers in this auto-intoxication theory. Bouveret and Devic, and likewise Kulneff, have been able to obtain from the gastric contents of patients with chronic ischochymia by Brieger's method (extraction with alcohol and precipitating with chloride of mercury) toxic products of the diamine group. Ewald and Jacobson, and later Albu, have obtained from the urine of a patient affected with tetany an alkaloidal substance (the picrin salt). This substance usually appeared in the urine during the attacks of tetany only and not during the intervals. Bouveret and Devic are of the opinion that the toxic products develop much quicker in cases of hyperchlorhydria if alcoholics have been indulged in. Although the auto-intoxication theory seems to be the most plausible, its verification remains to be demonstrated.

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[1] Schlesinger: Berl. klin. Wochenschr., 1894, No. 9.

[2] Kulneff: Berl. klin. Wochenschr., 1891, No. 44.

CHAPTER XII.

ABNORMAL CONDITIONS WITH REFERENCE TO THE SIZE, SHAPE, AND POSITION OF THE STOMACH.

Abnormalities in the Size of the Stomach.

In the normal state, the size or capacity of the stomach varies within wide limits, and this is more marked in pathological conditions. The following figures of capacity were obtained by Ziemssen[1] as the result of a large number of post-mortem examinations of the stomachs of persons of about the same size who during life had never manifested signs of digestive troubles. The largest stomach of these held 1,680 c.c. (or fifty-six ounces), the smallest 250 c.c. (eight ounces); the other figures ranged between these limits. While some years ago any stomach of very large size was considered as diseased, Ewald first pointed out that the organ, no matter how great its capacity, may still be able to work perfectly and satisfactorily. He therefore suggested that an acquired or congenital large stomach with normal functions should be designated as "*megastria.*" A very large stomach causing manifest digestive disturbances is generally spoken of as a *dilated stomach* (dilatation of the stomach, gastrectasia). The most extensive degrees of gastric dilatation are found in cases of obstruction of the pylorus.

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[1] Ziemssen, cited from C. A. Ewald: "Diseases of the Stomach," p. 110.

Angustatio ventriculi denotes an extremely small stomach. In very marked degrees of this condition the stomach may have a capacity of hardly an egg in size, and may appear even narrower than the duodenum (Haller). Angustatio ventriculi is generally found in most cases of œsophageal or cardiac strictures (principally cancerous); occasionally, however, it occurs alone in cirrhosis ventriculi.

ABNORMALITIES IN THE SHAPE OF THE STOMACH.

The shape of the stomach is occasionally found altered, caused by cicatricial changes after extensive ulcers. The *hour-glass form* is one which gives rise to grave disturbances and can frequently be recognized during life. Inflation with carbonic-acid gas shows the hour-glass shape of the organ; lavage six to seven hours after a meal will occasionally fail to remove all the contents. After the wash-water has come out clear for a time there may occur a sudden admixture of chyme.

ABNORMALITIES IN THE POSITION OF THE STOMACH.

The abnormal positions of the stomach may be either congenital or acquired. Among the congenital abnormalities we would mention the *transposition of the stomach* in the thoracic cavity, which occurs if there is a partial or a complete defect at the diaphragm. The stomach is found to be situated on the right side of the abdomen (pyloric portion to the left) in cases of general transposition of the viscera. Both these

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[1] Haller: "Elem. Physiol.," Lib. xix., Sect. 1, § 3.

anomalies are extremely rare. Among acquired anomalies a *vertical position* of the stomach is occasionally found. The pylorus is then situated much lower and farther to the left than normally. This condition is mostly found in women and can be easily recognized either by the gastrodiaphane or by inflation of the stomach, which reveals a lengthy but narrow configuration, its horizontal diameter not extending to the right of the linea alba.

Descensus ventriculi or *gastroptosis* (low position of the stomach) is the most frequent anomaly; it usually occurs in connection with a ptosis of several other intestinal organs, and will therefore be best described under enteroptosis, or Glénard's disease.

Enteroptosis, or Glénard's Disease.

Definition.—Downward displacement of the stomach, right kidney, and other organs of the abdominal cavity, attended with digestive disturbances.

General Remarks.—Descent of the stomach as well as of other abdominal organs was described many years ago by Virchow, Leube, Landau, and other authors; yet to Glénard[1] must be awarded the credit of having first sufficiently emphasized the importance of this condition, of having recognized its clinical significance, and established it as a distinct affection.

The idea which led the French physician to the discovery of the disease designated by his name was the fact that the whole digestive tract, which from the mouth to the anus is ten or fifteen times longer than a straight line connecting both points, is arranged in the form of different baldachins suspended on six loops[1] by means of ligaments at the posterior wall of the abdomen.

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[1] F. Glénard: Lyon Méd., 1885, p. 450.

The zigzag direction of the loops offers the possibility of too great a bend, sometimes at such an acute angle that it causes obstruction to the passage of the ingesta or secretions at the six main points of fixation. This might occur at the gastro-duodenal, duodeno-jejunal, or transverse,[2] sigmoido-rectal curvatures.

The ligaments are not all of equal strength and the points of fixation of several of them are especially weak. This is true of the gastro-duodenal and the transverse colon ligaments. Thus, from a theoretical point of view, it is apparent that the possibility exists that the weak ligaments may give way under favorable conditions, and that a falling of that part of the intestine may result. This would naturally exert increased traction on the next fixation point, and might cause an obstruction to the passage of the contents of the intestine, or, in other words, a partial entero-stenosis. In forty autopsies Glénard several times found the colon transversum displaced and stenosed. He recognized that these changes in the anatomical position must give rise to troubles, which should be considered dependent upon this condition. In examining all his patients with digestive troubles, he found that there were many so-called "nervous dyspeptics" in whom he could discover, by a thorough investigation of the abdomen, that some abnormal position of the intestines existed. He described the following objective points as characteristic of this affection:

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[1] (1) Anse gastrique; (2) anse duodénale; (3) anse iléo-colique; (4) anse colique transverse; (4 *a*) costo sous-pylorique; (5 *c*) sous-pylori-costale; (6) anse colo-sigmoidale.

[2] "Colique sous-costal droit," "colique sous-costal gauche," "sous-pylorique du transverse."

1. Splashing sound (*clapotement epigastrique*).
2. Pulsation of the abdominal aorta (*battement aortique*).
3. "Corde colique transverse."
4. In the right hypochondriac region frequently movable kidney.

By the term "corde colique transverse" Glénard means the resistance which is found lying over the aorta 3 to 5 cm. above the navel, running horizontally 6 to 10 cm. on each side of the median line. This gives the impression of a ribbon 1 cm. in width, and was supposed by Glénard to be the displaced colon transversum, for pressure on the right iliac region at the beginning of the colon ascendens produced rumbling sounds in the "corde transverse." He consequently concluded that all the symptoms in these patients were caused by this abnormal position of the intestine. He named this condition "enteroptosis."

Etiology.—It is generally accepted that the corset plays a predominant part in the causation of the downward displacement of the abdominal organs; confinement is also believed to be a great factor of this disorder. But besides these two points, which refer only to the female sex, there are some other conditions which likewise predispose to enteroptosis and have reference to both sexes, namely, acute diseases of a grave nature and protracted ailments accompanied by a considerable loss of flesh.

Enteroptosis is found quite frequently, especially among women. In order to give a clear illustration of this fact, I take at random the number of patients recorded in my private day book for the months of January and April, 1896. In the month of January I saw 57 male patients with gastric disturbances; among them were 4 with a distinct enteroptosis and right movable kidney (third and fourth degrees); the number of women with the same disturbances amounted to 33, and 13 had distinct enteroptosis with right movable kidney. The month of April showed similar figures: Number of male patients, 84; enteroptosis with movable kidney, 5. Number of females, 59; enteroptosis with movable kidney, 19. The figures of these two months put together show: Number of male patients, 141; enteroptosis with movable kidney, 9. Number of female patients, 92: enteroptosis with movable kidney, 32. We find the percentage of enteroptosis to be 6.2 among the male patients with digestive disorders, while in the females similarly afflicted we find the percentage to be 34.8. The great frequency of enteroptosis which has been noted by Glénard is fully sustained by the figures just given.

Glénard, however, goes too far, when he ascribes all digestive disturbances to this faulty position of the abdominal viscera; nor is enteroptosis always the only cause of all the morbid symptoms. According to my own experience, pronounced enteroptosis may exist without any manifestations of morbid phenomena. It is also self-evident that all kinds of gastric affections occur in enteroptosis as well as in other disorders; for enteroptosis does not produce immunity from digestive diseases. In this way it appears that the diagnosis of enteroptosis will often have to be supplemented by the elucidation of some other factors besides the position of the abdominal viscera. I, however, concur with Glénard that in many instances enteroptosis, as such, is liable to produce symptoms, and that these symptoms can be materially improved by the outlined treatment of Glénard which will be described later.

Symptomatology.—The first stage of the disease consists in a prolapse of the intestines, particularly of the right part of the colon transversum, due to a relaxation of the weak ligamentum colico-hepaticum. The colon ascendens and colon transversum, losing their ligamentous suspension, sink down, and thus the colon transversum, instead of running straight across the abdominal cavity, runs obliquely from below upward. At the left end the transverse colon is held in place by the strong ligamentum gastro-colicum. The acute angle produced at this point by the prolapse of the other end of the transverse colon causes a partial occlusion of the lumen of the gut (enterostenosis). The transverse colon, therefore, remains contracted and empty, and gives the condition described as "corde transverse." Coincident with the descent of the transverse colon there is a relaxation of the ligaments (mésenteries) of the small intestines, and this produces a dragging down of the stomach, and causes the liver and kidney, through the ligamentum gastro-colicum, to assume a lower position than normal (*hepatoptosis* and *nephroptosis*). Thus there may be a prolapse of all the intestines—*splanchnoptosis.* The enteroptosis causes enterostenosis and increases the specific gravity of the intestines, because they do not contain gas, thus diminishing the abdominal tension. A *circulus vitiosus* is produced which, if not interfered with, grows worse.

The *subjective symptoms* of this disease are: weakness and a constant feeling of lassitude; difficulty in digestion of fats, farinaceous food, acids, pure wine, pure milk, with an increase in the digestive troubles about three hours after meals; sleeplessness; usually constipation or irregularity of the bowels.

The *objective conditions* are: decreased tension of the abdomen; prolapsus of the abdominal contents (enteroptosis, gastroptosis, frequently movable kidney, movable liver); enterostenosis.

Glénard distinguishes three different periods of the disease: (1) Atonie gastrique par entéroptose; (2) mésogastrique, gastroptose; (3) neurasthénique, entérostenose—and describes them as follows:

During the first period of the disease (atonie gastrique par entéroptose) the patient eats everything, but experiences slight somnolence or a burning sensation after meals; about 2 o'clock A.M. the sleep is interrupted for a few minutes. Generally there is one evacuation of the bowels in the morning, of somewhat diarrhœic nature; there is a gradual loss of strength.

In the second period (mésogastrique, gastroptose) the patient avoids fat, farinaceous food, acids, milk, wine; complains of a sensation of dragging, false hunger, and emptiness about three hours after meals. About 2 o'clock A.M. he remains awake for two or three hours; suffers from constipation, interrupted once in a while by diarrhœic evacuations; always feels tired, particularly when arising and about 3 o'clock in the afternoon.

In the third period (neurasthénique, entérostenose) the patient has lost about thirty or forty pounds and is not sufficiently nourished; he has lived on milk diet, on purées, beef tea—on the most improbable meals; complains of a weighty sensation or cramps in the stomach, and is almost constantly suffering. He does not sleep; the constipation is most obstinate; the daily enemata with difficulty effect an evacuation of fatty scybala surrounded by mucus or pseudo-membranes from time to time. There is constant complaint of great weakness, so that he hardly leaves the room, and lies on the lounge constantly. He presents the most varied nervous symptoms: cerebral, spinal, sympathetic, both psychical and physical.

Diagnosis.—As has been shown by Ewald,[1] the best test for the recognition of enteroptosis is the demonstration of an existing gastroptosis. This can occasionally be elucidated by the splashing sound, which in these cases can be produced on the left side of the abdomen over an area extending from the navel or somewhat above it down to the symphysis. The inflation of air is another means for detecting the position of the stomach. When the stomach is inflated the lesser curvature, in cases of gastroptosis, is visible midway between the ensiform process and the navel or just in the neighborhood of the umbilicus. This is the method which Ewald used in his cases. Gastrodiaphany has been recommended by me[1] as a reliable means of recognizing gastroptosis, and from my further experiences in this line I must say that the picture which the gastrodiaphane produces in this condition is very striking: the stomach is here visible on the abdomen as a red zone lying between the navel and the symphysis.

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[1] C. A. Ewald: Berliner klin. Wochenschr., 1890, Nos. 12 and 13.

Movable kidney is another essential symptom of enteroptosis. The recognition of the movable kidney is quite easy. It is only necessary to practise palpation with both hands, putting one hand on the back of patient behind the lumbar region, while the other hand is held flat below the margin of the false ribs covering the lower outside angle of the abdomen. By having the patient inspire deeply, the kidney, if movable, is felt to slip between both hands; slight pressure with the hand on the lumbar region will facilitate the recognition of an existing movable kidney.

While Israel is of the opinion that on deep inspiration even a normal kidney may be partly felt by this method of examination, Glénard considers all cases in which the kidney can be perceived by palpation as abnormal. This writer distinguishes four degrees of movable kidney:

First degree of nephroptosis: The lower part of the kidney can be palpated during deep inspiration; during expiration the kidney slips back to its place and it is impossible to arrest it.

Second degree: The greater part of the kidney can be palpated and it can also be arrested, but its superior margin cannot be felt.

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[1] Max Einhorn: "On Gastrodiaphany." New York Medical Jour
[1] December 3d, 1892. "Glénard's Disease." The Post-Graduate, No. 2.

Third degree: The superior margin of the kidney can be reached on deep inspiration.

Fourth degree: The whole kidney is accessible to palpation even during expiration (the movable or wandering kidney of the older writers).

Treatment.—As this whole series of symptoms is caused and explained by (1) enteroptosis, (2) enterostenosis, and (3) deficient nutrition, the fundamental indications for the successful treatment are pointed out by Glénard as follows:

1. The intestines must be raised and maintained in their position;
2. The abdominal tension must be increased;
3. The bowels must be regulated;
4. The secretions of the digestive tract and of the annexed glands must be stimulated;
5. The alimentation must be regulated and the digestion assisted;
6. The organism must be stimulated.

The first two points are accomplished by wearing a bandage reaching from the symphysis to the navel and exerting a pressure upon the hypogastrium from below upward. This bandage raises the intestines and increases the tension of the abdomen.

In order to regulate the bowels Glénard gives his patients, a quarter of an hour before breakfast, sodium sulphate 4.0, magnesium sulphate 3.0, in half a glassful of water; or half a glass of Hunyadi János; or one-quarter of a glass of Rubinat; or a teaspoonful of Carlsbad salt; or pills consisting of 0.05 aloes, or 0.05

extractum rhei. The fourth requirement must be accomplished by massage, electricity, and lavage of the stomach; and the sixth by gymnastic exercises.

As to alimentation Glénard has given the following table:

During the First Stage of the Disease.—Boiled meat, roast game, odorless squabs, brain; farinaceous vegetables (lentils, potatoes), rice, carrots; grapes, very ripe fruit; fried eggs, oysters, liver (fat); Gerx and Gruyère cheese; red wine diluted with water; sauces, juices, lards, fries, Italian pâtés, salad; pure red wine, creams, undiluted boiled milk, fresh milk.

Second Stage of the Disease.—Roast meat (beef, mutton, veal, chicken), lean ham; fish (sole, white fish, trout); scrambled eggs; fresh vegetables, well-cooked, English style; cheeses (Brie, Camembert); baked apples, preserves, compôtes; chocolate, beer, cider (?), white wine (?).

Third Stage of the Disease.—Raw meat (beef, mutton), raw eggs, stale bread, coffee with milk (one-third milk, two-thirds coffee); coffee, tea, water, water with cognac, champagne; broiled meat (roast beef, mutton, lamb chops, tenderloin of beef); eggs, bouillon, preserves.

I agree with Glénard in regard to the bandage which should support and elevate the intestines, but the medicinal and dietetic treatment must be made dependent upon the result of a chemical analysis of the stomach contents; for, according to my experience, the chemical condition of the stomach in these cases of "enteroptosis" is not always alike. In those cases where there is hyperacidity—which is the case with the greater number of this class of patients—Glénard's rules are excellent; but where there is an insufficiency or an absence of HCl, the treatment will have to be modified accordingly.

CHAPTER XIII.

NERVOUS AFFECTIONS OF THE STOMACH.

GENERAL REMARKS.

DEVIATIONS from the normal process of gastric digestion not based upon pathologico-anatomical changes are considered as gastric neuroses. We are accustomed to ascribe the different functions of the stomach to the action of special nerves. Although physiological experiments have not as yet enabled us to discover special nerves governing secretion, motion, or sensibility of the organ, still clinically many facts speak in favor of such an assumption. The neuroses of the stomach are also occasionally designated as "functional disturbances." The different gastric neuroses may appear either separately or, occasionally, in combination with each other. As a rule, these neuroses occur most frequently in women, especially between the ages of seventeen and forty; in men also the middle period of life shows a predilection for these disturbances. As a predisposing factor for these neuroses the following conditions must be recognized: severe mental exertions, worry, unusual excitement, sexual excesses. The recognition of the neurosis is not always very easy. The principal point of importance is the exclusion of any organic lesion of the organ. The following symptoms, which frequently recur in gastric neuroses, have been especially well described by Boas,[1] and will facilitate the recognition of the nervous element of the affections in question.

1. The entire nervous system shows more or less deviation from the normal. There may be present headache, insomnia, conditions of depression, or, on the other hand, excitation, increased sensitiveness. Objectively there may be an increase or diminution of the reflexes of the skin and tendons, hyperæsthesia at some, paræsthesia or anæsthesia at other places. Frequently there exists constant or intermittent polyuria. The general condition may be good or various degrees of emaciation may be present.

2. The digestive system is characterized by a condition of "labile gastric intestinal function." The subjective symptoms are not always necessarily connected with the act of digestion. The digestive complaints are usually independent of the quality and quantity of the ingested food. Dietetic errors are, as a rule, not followed by any aggravation of symptoms; while the character of food does not have any influence upon the severity of the symptoms, there are occasionally some other factors in the way of climate and surroundings which play an important part in the amelioration or deterioration of the condition. Objectively changes in the condition of gastric secretion and of the motor function of the stomach as well as of the intestines frequently occur. Thus complete anacidity may alternate during a short period with normal secretion. The condition of the motor functions of the stomach frequently changes. The state

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[1] Boas: "Specielle Diagnostik und Therapie der Magenkrankheiten," 2te Auflage, p. 204.

of the bowels is also very variable; thus constipation frequently alternates with diarrhœa, or, at a time when the bowels are regular, an acute diarrhœa may suddenly appear.

According to Rosenthal,[1] the neuroses of the stomach are best divided into: (1) Sensory, (2) motor, and (3) secretory neuroses of the stomach.

SENSORY GASTRIC NEUROSES.

For the sake of greater clearness sensory gastric neuroses are best divided into two main groups: (*a*) Comprising abnormal sensations of a more or less general character; (*b*) special sensations emanating from the stomach itself.

(*a*) *Abnormal Sensations of a General Character.*

The need for food makes itself felt through the sensation of hunger, the need for drink through that of thirst. The nervous centre for these sensations appears to be located in the medulla oblongata (R. Ewald[2] and Rosenthal). The stomach is the organ into which all substances satisfying hunger and thirst are introduced. The act of satisfying the sensation of hunger with relish is called "appetite." Normally there appears in man a slight feeling of hunger at the usual mealtime. A man relishes the food he takes until at the end of the meal a feeling of satiety appears. The latter may be best characterized by noting the point at which the sensation of hunger has entirely disappeared. On going beyond this point to any extent—*i.e.*, by continuing to introduce further food into the organ—a sensation of weight and tightness around the stomach develops. This can then be hardly considered as a normal process, and is the way the stomach responds to interference with its habitual mode of work.

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[1] M. Rosenthal: "Magenneurosen und Magenkatarrh," Wien und Leipzig, 1886.

[2] R. Ewald: Cited from C. A. Ewald, *l. c.*, p. 380.

The time at which hunger appears is physiologically variable and depends upon the time persons are accustomed to take their meals. On this account there are people who feel hungry only twice a day, as they are in the habit of taking only two meals daily; others again who feel hungry about every three hours, as they are accustomed to take five meals a day, and so on. Although the ingestion of food may sometimes lead to some variations in the time at which hunger is experienced—so that a man who is in the habit of taking a light meal at a certain period during the day, after having partaken of a much heavier meal than customary, will perhaps not feel hungry at his next meal—this is of less consequence than the influence of the time at which the meals are ordinarily taken. Thus every one knows that if he has been accustomed to take his lunch, for instance, at one o'clock, the hungry feeling will appear at one, and if not satisfied within a certain period of time (half an hour to an hour), then very frequently it will disappear to return at the next mealtime.

Pathologically we find that the above-named sensations may exist either in an exaggerated form, or may be greatly diminished or even absent.

Bulimia.

Bulimia (βοῦς, ox, λιμός, hunger) or cynorexia (κύων, dog, ὄρεξις, appetite), or hyperorexia, denotes a condition in which the feeling of hunger is enhanced, appearing more frequently and in a more intense degree than in the normal state. Bulimia may exist alone as a primary affection or may be associated with various other disorders, and is then considered as a secondary affection. Thus ulcer of the stomach, hyperchlorhydria, cancer of the stomach, intestinal troubles, tapeworm, Graves' disease, hysteria and neurasthenia, and tumors of the brain are all liable to be complicated with bulimia.

Symptomatology.—Bulimia may appear periodically and last only a short time (a few days) or may exist chronically and last for months or even years. The periodical form is usually characterized by much greater intensity than the chronic. An attack of bulimia may be described as follows: In the midst of perfect euphoria, a feeling of intense hunger overcomes the patient with a persistent desire to satisfy it. This hungry sensation is associated with a gnawing feeling in the stomach, and the utmost fear and anxiety, as if something alarming were going to happen. If the feeling of hunger is not satisfied very quickly, then severe headache and trembling of the body or even fainting spells may occur. The patient in such a condition, as a rule, disregards conventionalities and tries to obtain whatever food he can, in order to overcome this painful craving of his stomach. Generally a small quantity of nourishment is sufficient to arrest the attack, sometimes, however, large quantities of food have to be taken. Thus Peyer[1] describes the case of a woman who was suddenly seized with an attack of bulimia, so that she could not return home from the house of a neighbor whom she was visiting. In forty-five minutes she ravenously devoured three pints of milk, twenty-three eggs, and two pints of strong wine. After this meal she became quieter, went to sleep, and awoke perfectly well on the next day.

The primary cause of bulimia appears to be a derangement of the nervous apparatus for the hunger sensation. This derangement may be either central or peripheral. Hypermotility was found by Leo[2] in a patient troubled with bulimia; but although present in some instances it is by no means a constant symptom. Thus Ewald[3] reports a case of bulimia in which the motor function of the stomach was perfectly normal.

Treatment.—The treatment should always be directed against the primary cause of the trouble. Thus helminthiasis must be removed by extract of male fern. Hyperchlorhydria should be treated by carbonate of soda, diabetes by a meat diet, and so on. Cases of neurasthenia or hysteria will have to be treated as such. The following means at our command may be directed against bulimia as a distinct disorder:

Very frequent light meals (every two hours).

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[1] A. Peyer: "Beitrag zur Kenntniss der Neurosen des Magens und des Darms." Correspondenzbl. schweizer Aerzte, 1888, No. 20.

[2] Leo: "Verhandlungen des Vereins für innere Medicin," Berlin, 1889.

[3] C. A. Ewald: *l. c.*, p. 379.

The bromides should be given in large doses, twice daily, as for instance potassium or sodium bromide, in doses of 1.5 gm. (gr. xx.), or bromide of strontium 12 gm. to 60 c.c. peppermint water, one teaspoonful twice daily, or—

℞ Ammon. brom.,
Sodii brom., ... āā 8.0 ʒ ij.
Aq. menth. pip., ... 60.0 ℥ ij.
S. One teaspoonful twice daily.

Rosenthal[1] recommends the use of cocaine in doses of 3 to 5 cgm. twice daily.

Opium or codeine, in doses of 3 to 4 cgm. (gr. ss.) three times daily, may be advantageously employed.

Arsenic, is also of value.

℞ Sol. arsen. Fowleri,
Aq. menth. pip., ... āā 5.0 ʒ iss.
S. Six drops three times daily.

A change of climate, sojourn in the mountains or at the seashore, is frequently beneficial.

Parorexia (*Perversion of Appetite*).

The appetite is sometimes manifested for special and peculiar kinds of food, and to this condition the name parorexia has been applied. There exist three degrees of parorexia: 1. *Malacia:* an increased desire for spiced food-stuffs, as for instance mustard, salad, vinegar, green fruits, etc. 2. *Pica:* the appetite manifests itself for substances which are not in reality foods, thus for coal, ashes, chalk, earth, sand, insects. 3. *Allotriophagia:* there seems to be a craving for substances which are decidedly disgusting and harmful, as for instance fæcal matter, needles, pins, etc.

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[1] Rosenthal: *l. c.*

While the first form (malacia) is met with in many disturbances of the stomach or in different neurotic conditions of the system (neurasthenia), the latter two conditions appear only in severe forms of hysteria, and more frequently in idiots and lunatics.

Polyphagia.

Polyphagia denotes a condition in which excessive amounts of food have to be taken in order to satisfy the feeling of hunger. Polyphagia is met with in the same conditions as bulimia, and especially in the following disorders: Cancer of the pancreas or spleen, fistulous opening of the gall bladder, diabetes, and some tumors of the brain. But polyphagia may also be observed as a primary affection in neurotic persons. Like bulimia, polyphagia either appears in the form of attacks of short duration or may exist as a chronic trouble. The amount of nourishment which may be devoured by the patient during such an attack of polyphagia is sometimes enormous. Thus Rosenthal reports the case of a woman, twenty-eight years old, who devoured at one meal an entire large fried goose and a big portion of bread. Bouveret[1] mentions a case reported by Percy: The patient, Tarare by name, when seventeen years old could partake of one hundred pounds of meat in twenty-four hours.

Akoria.

By akoria is designated the absence of the sensation of satiety (κορέννυμι, I feel satiated). The main symptom of this condition consists in the loss of the feeling a person normally experiences at the end of the meal which tells him that he has had enough. The patient with akoria never knows when to stop eating. Frequently akoria is found combined with polyphagia, but not always. It is met with in similar conditions as bulimia and polyphagia, neurasthenics and hysterics forming the large majority of cases.

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[1] L. Bouveret: "Traité des Maladies de l'Estomac," Paris, 1893, p. 654.

Nervous Anorexia.

Under the term anorexia (ὄρεξις, appetite) is understood a complete absence of the sensation of hunger, combined with loss of appetite. While anorexia is met with in almost all organic as well as functional disorders of the stomach, "nervous anorexia" may at times appear as a primary affection, unassociated with the conditions just mentioned. The cause of this primary anorexia may be either a depressed condition of the hunger centre or, according to Rosenthal, a kind of hyperæsthesia of the gastric mucous membrane. As etiological factors are frequently found great mental depression, as after a death in the family, worry, anxiety, fright, etc.

Symptomatology.—At first the patient complains of loss of appetite and begins to eat less. As a rule, all kinds of meat are first discarded from the bill of fare. Later on bread, butter, and afterwards most solid foods are avoided and the patient subsists only on a small quantity of milk and some soup. For quite a while the patients apparently maintain their healthy appearance and do not even seem to lose in weight. The small quantities of food the patient takes are now still further reduced. Even the encouragement on the part of the family to take more nourishment fails to have any effect; the patient, as a rule, obstinately refusing to do so. It was Sollier[1] who laid particular stress upon this symptom, and suggested designating this condition by the name of "*sitieirgy*" (σῖτος, food, and εἴργω, refuse). At this stage the patients lose considerably in weight and begin to look emaciated, have cold extremities, a slow pulse (50 to 60) and reduced temperature (95 to 96° F.); they grow anæmic and weak, and very soon are hardly able to leave their beds. The appearance of such a patient in this stage of the disease is very similar to that of a consumptive. The face is pale, the eyes sunken, the skin dry, the extremities slightly cyanosed, and the abdomen retracted. If the patient still continues to refuse food, the condition may terminate fatally. Such cases of nervous anorexia ending in death have been reported by Gull,[2] Charcot,[3] Rosenthal,[4] and others.

Rosenthal's case was as follows: The patient, female, seventeen years old, had suffered for eighteen months from anorexia. After this period she took only 30 to 40 gm. of milk per day. The patient became emaciated and looked like a skeleton. She could not sleep and could not leave her bed. Isolation of the patient or forced alimentation could not be employed under the existing circumstances. Symptoms of rapidly progressing inanition appeared, in connection with shortness of breath, dysphagia, and alalia, all indicating anæmia of the bulbar centres, the case terminating fatally.

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[1] Sollier: Revue de médecine, août, 1891.

[2] Gull: Lancet, 1868.

[3] Charcot: "Œuvres complètes," t. iii., p. 240.

[4] Rosenthal: *l. c.*

Diagnosis.—After the development of nervous symptoms no difficulty is encountered in making the diagnosis of anorexia. It is necessary first of all to exclude organic affections of the stomach. The early stage of tuberculosis may at times be mistaken for nervous anorexia, especially if there exists no cough or if tubercle bacilli are absent in the sputum. One point, which is quite valuable in making the diagnosis of nervous anorexia, is the circumstance that patients with the latter condition are not in any way alarmed about their loss of appetite, while anorexia existing in organic disorders of the stomach, like cancer, etc., evokes fear and anxiety.

Treatment.—In the early stage of the disease the treatment is quite easy. It is merely necessary to impress the patient with the idea that he must take sufficient food. The meals should be taken at regulated periods. The patient should be given food without any previous questioning as to whether he would like it or not. At meal-times he should be encouraged to take his entire portion. A liberal variety of foods is also of importance. In the way of medicines most of the bitter tonics, which stimulate the appetite, are indicated. Thus nux vomica, in the form of the tincture, may be given in doses of ten drops three times daily, or fluid extract of condurango, twenty drops three times daily. Boas recommends fluid extract of Peruvian bark, one teaspoonful three times daily. Orexinum basicum in doses of 2 to 3 dcgm., in wafers three times daily, is also useful. All these stomachics should be given about one-quarter of an hour before meals.

The longer the disease has existed the more difficult it becomes to combat it successfully. If it is already of long standing, and has led to high degree of emaciation and other pronounced symptoms of inanition, then treatment at the home of the patient is hardly ever successful. Charcot first laid stress upon the importance of isolating the patient from his surroundings. This plan of treatment has been still further advanced by Weir Mitchell[1] in this country, and this method is known as the Weir Mitchell rest cure. The principle of this cure consists first in isolation of the patient from his family; secondly, in strict supervision by the physician, and by a constant attendant; thirdly, in ample feeding, so that a state of hypernutrition may be established; fourthly, in the application of massage and electricity, which may be considered as adjuncts to the above.

In cases in which food is absolutely refused, even after isolation, forced alimentation or gavage (feeding by means of the tube) becomes necessary. Frequently after having nourished the patient by artificial means for a few days, he gains the conviction that his stomach is able to digest food and then begins to eat spontaneously. Good fresh air and an organic iron preparation like Gude's peptomangan or Pizzala's or Dietrich's albuminate of iron or Boehringer's ferratin may be advantageously administered, especially after the patient has begun to improve. Arsenic may also be administered, either alone or in conjunction with the above-mentioned iron preparations; thus Fowler's solution, two to three drops three times daily in water, or Levico or Roncegno mineral waters may be given, one to two tablespoonfuls daily. As a rule, the patient should not leave the sanitarium until he has regained his former weight. In the latter instance there is no danger of relapses.

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[1] Weir Mitchell: "Fat and Blood," Philadelphia, 1884.

(*b*) *Special Sensations Within the Stomach Itself.*

In its normal state the stomach barely transmits any sensations whatever to our consciousness. As a rule we lose track of the food we take as soon as it has passed the palate and has been swallowed. Plain articles of food and the most delicious dishes are equally quickly forgotten. Cold articles of food and warm beverages do not manifest their presence by any special sensations within the stomach. Notwithstanding these facts it is certain that the stomach physiologically is not void of sensation. Thus ice-water taken in large quantities on an empty stomach gives rise to a sensation of slight cold in the gastric region, especially near the scrobiculus. The faradic current applied within the stomach (one electrode within the organ, the other at the back) produces a sensation either of slight burning or of weight in the gastric region, provided the current is sufficiently strong. If it were not for these experiments, we might imagine that the stomach is an organ which normally does not transmit any perception to the brain. This fact, which applies alike to the stomach as well as to the other vegetative organs of our system, is of great importance and a wise provision of nature; for it enables us to occupy ourselves with all kinds of brain work without being constantly disturbed by the functional processes and needs of our digestive organs.

In contrast to the small degree of sensation which physiologically exists in the stomach, the activity of the sensory apparatus may be pathologically increased and thus give rise to marked discomfort.

Gastric Idiosyncrasies.

We sometimes meet with persons who manifest an idiosyncrasy toward certain substances, the ingestion of which gives rise to symptoms emanating from the alimentary tract alone or combined with other disorders, especially of the skin. The articles most apt to cause these disturbances are certain kinds of fruit, especially strawberries, lobsters, soft-shell crabs, oysters, fish; but besides these substances there are several other articles of food which may produce disagreeable symptoms in certain individuals. Thus I know of several members of one family who betray very unpleasant symptoms (feelings of pressure, pain, belching) if a trace of onion is added in the preparation of the food. In all these instances this is not an imaginary trouble, for even if the substances mentioned are given in a disguised form, so that the person is unconscious of taking them, he will nevertheless suffer from the same symptoms. Generally only gastric symptoms are produced: pressure, pain, belching, rarely nausea and vomiting; sometimes in addition to these there appear eruptions on the skin, either erythema or urticaria. It is remarkable that in these instances the same individual always manifests the same symptoms upon taking the respective article against which he has an idiosyncrasy.

Talma[1] described several cases in which there was an idiosyncrasy against hydrochloric acid. The slightest quantities of a highly diluted solution of hydrochloric acid (1:750) produced pains within the stomach. I also have observed a case in which severe pains in the gastric region usually appeared one to two hours after meals for a period of over seven years. The analysis of the gastric contents one hour after the test breakfast revealed the presence of free hydrochloric acid and a degree of acidity of 40. As the symptoms corresponded to those found in hyperchlorhydria, I administered alkalies, notwithstanding the fact that the acidity in this case was rather diminished. The symptoms disappeared at once, and the patient, who was quite emaciated, began to gain in weight rapidly. The treatment was continued for over six months, and the improvement persisted. Here the pains were probably due to a kind of idiosyncrasy of the stomach against its own hydrochloric acid.

In all these cases nothing can be done to rid the stomach of this peculiarity, and the persons affected must abstain from the offending articles, or else suffer for their indulgence.

Abnormal Sensations.

Sensations of heat or more seldom of cold, of heaviness or of a foreign body within the stomach are present in some cases; and these may manifest themselves no matter whether the stomach be empty or not. They are not due to changes in the chemical condition of the gastric juice, but are merely symptoms originating from the nerves of the stomach. With these sensations we may also class the feeling of constriction or of cramp within the organ and the "epigastric beating." The latter is sometimes due to an increased pulsation of the abdominal aorta. While in the normal state people never notice these pulsations, in those affected the beating sensation is very tormenting and is sometimes the cause of many sleepless nights. All these abnormal sensations are usually found in nervous people, neurasthenics or hysterics.

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[1] Talma: Zeitschr. f. klin. Medicin, 1884, Bd. viii., p. 407.

Nausea also belongs to the abnormal sensations. Besides its occurrence in organic affections of the stomach it is also found alone, and it is then called "nervous nausea." It is met with in diseases of the central nervous system and in both neurasthenics and hysterics. Sometimes it is also caused by affections in distant organs, as for instance the uterus or the ovaries, and must then be considered as a reflex symptom. Nausea appears most frequently in the fasting state, sometimes, however, the patient also experiences the nauseous feeling shortly after meals, from half an hour to an hour. The treatment should therefore be directed principally against the general condition. Sometimes the intragastric application of the galvanic current will greatly facilitate the cure.

Hyperæsthesia of the Stomach.

In hyperæsthesia of the stomach there is an abnormal sensitiveness of the mucous membrane even after the ingestion of ordinary food. The patient experiences a sensation of fulness, of slight burning, sometimes even of pains in the gastric region after meals. Many organic affections of the stomach are accompanied by this condition. As a primary affection it appears most frequently, according to Rosenheim,[1] in chlorotic girls and women. Occasionally it is met with in people with a weakened constitution; thus after excesses *in baccho et in venere*, or after long periods of unsuitable dieting.

Symptomatology.—In the mild form of hyperæsthesia the patient experiences a sensation of weight or fulness after meals. If the disease, however, is more pronounced, real pains occur after meals, and the stomach after a while may become so irritable that the contact of food with the mucous membrane produces vomiting. In the latter instance the food is partly rejected soon after the meal. As a rule only a small quantity of the ingested food is vomited, while the greater part is thoroughly digested. That is the reason why in these instances the patient does not emaciate. If, however, the bulk of the food be ejected, this symptom may soon lead to grave inanition. The disagreeable sensations which exist in this affection frequently lead to a diminution of the quantity of food taken (a condition develops which may be termed "sitophobia"—fear of food), and in this way again the nutrition may be impaired.

Diagnosis.—In addition to the above symptoms an examination discloses that the gastric and epigastric regions are painful on pressure. The secretory and motor functions of the stomach may be found normal or a slight degree of hyperchlorhydria may exist. In the differential diagnosis we must exclude gastric catarrh, ulcer and erosions of the stomach, before diagnosing hyperæsthesia as such. In catarrh of the stomach the sensation of fulness or weight appears, as a rule, not immediately after meals, but some time afterward. Besides there exist in catarrh of the stomach many other symptoms (loss of appetite, a diminished secretion, etc.), which are not met with in this condition. In ulcer of the stomach the pains are more violent. They are also dependent upon the quality of the food ingested, while in hyperæsthesia the abnormal sensations are pretty much the same whether coarse substances or very light food be ingested. In erosions of the stomach the pains are also usually of a light nature, but here, as in ulcer, we find that the pains depend to a certain extent upon the quality and quantity of the food taken. Another point of importance in this condition is the results obtained after the washing out of the stomach in the fasting condition of the patient. In erosions of the stomach, as a rule, several (two to four) small pieces of gastric mucosa are found in the wash-water; in hyperæsthesia this does not occur.

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[1] Th. Rosenheim: Berl. klin. Wochenschr., 1890.

Treatment.—For the hyperæsthesia occurring in chlorotic persons Rosenheim proposed the following treatment: The patient should be kept in bed, and the Priessnitz compress applied to the gastric region. The diet should consist at first of milk, to which small amounts of lime water are added, and which should be taken with a spoon. The addition of small quantities of tea or coffee to the milk is permissible. After a while the yolk of an egg with sugar and small quantities of cognac, wine jelly, scraped meat, or toasted bread are given. Of medicaments, Rosenheim advises the internal use of nitrate of silver.

℞ Arg. nitr., ...	0.2	gr. iij.
Aq. dest., ...	100.0	℥ iij.

S. Half a tablespoonful in a wineglassful of water, three times daily, half an hour before meals.

When the stomach has become less irritable, the patient should begin cautiously with solid food and tonics like iron and arsenic, in order to restore the organism to its normal condition.

In cases of hyperæsthesia not originating from chlorosis the best treatment consists in the administration of the bromides for a period of one or two months.

Gastralgia.

Synonyms.—Cardialgia, gastrospasmus, and gastrodynia.

By the term gastralgia is designated the occurrence of attacks of pains of more or less severity in the gastric and epigastric regions. These persist for a certain period and alternate with perfectly free intervals.

Symptomatology.—The attacks of. pains rarely appear suddenly. As a rule, they are preceded by short periods of various abnormal sensations; thus a slight feeling of nausea or of tension in the gastric region may exist. Increased salivation is also frequently one of the prodromal symptoms. Headache, feelings of faintness or vertigo may also precede the real attack. Very soon afterward an intense pain appears in the epigastric region, extending especially to the left side.

There exist a crampy sensation and a feeling of constriction, or there may be a feeling of intense burning. These pains and sensations frequently radiate to the back, to the shoulder blades, and over the whole abdomen. At such times the patient is overcome by a feeling of great anxiety. The extremities often grow cold, and cold perspiration appears on the forehead. The face is extremely pale, and bears the expression of anguish and anxiety. The patient frequently is unable to lie straight, and often assumes a bent position, so that the abdominal muscles are not stretched, but kept in a curved and relaxed condition. Sometimes the patient puts a pillow upon his abdomen and curls himself around it, holding it with his arms. The character of the pulse is variable. As a rule, it is accelerated, sometimes, however, it is rather retarded. The gastric region is mostly sunken; in rare instances protruding. While this region is sensitive to slight palpation, a more profound pressure does not, as a rule, cause any pain, and frequently rather relieves the patient's suffering for a moment. The duration of such an attack is very variable; it may last fifteen minutes only or several hours. At the end of the attack the pains disappear quite suddenly, and the patient now experiences a sensation of hunger. If the attack was of short duration (half an hour or so) the patient does not retain any symptoms of malaise after it, and is able to attend to his usual work. It is quite different with a severe attack that has lasted several hours. The latter leaves a feeling of extreme weakness for several days, during which the patient has to remain abed.

The frequency of these attacks is very variable, and different in each case. In some cases the attacks occur once in a few months or once in a year, while in others they appear every week or even every day. The attacks of idiopathic gastralgia do not seem to be dependent upon the quality or quantity of food ingested, nor to show any relation to the time of its ingestion.

Etiology.—With regard to etiology, gastralgia may be divided into the following forms:

(1) Gastralgia of stomachic origin; (2) central gastralgia; (3) neurotic gastralgia; (4) constitutional gastralgia; (5) reflex gastralgia.

Gastralgia of Stomachic Origin.—Besides occurring in connection with gastric affection, as for instance ulcer, cancer, hyperchlorhydria, peritonitic adhesions, gastralgia may exist as a primary affection of the stomach, either without any visible cause or after the ingestion of certain unusual or unaccustomed articles of food or spices; thus very strong black coffee or ice-cream may provoke an attack in people not accustomed to these substances.

Gastralgia of Central Origin.—Diseases of the brain are very seldom accompanied by gastralgia. Spinal disorders are much more frequently associated with the latter condition. In tabes especially gastralgia frequently occurs. Charcot deserves much credit for having first recognized the dependence of these gastric pains upon the spinal trouble. He described these attacks under the name of "crises gastriques." The pathological basis for the latter condition was found to consist in a sclerotic degeneration of the vagus nucleus or the vagus trunk (Kahler,[1] Demange,[2] Landouzy and Déjerine,[3] Oppenheim[4]). The gastric crises differ but little from the usual gastric attacks. As a rule, they begin with a prodromal period of lancinating pains in the limbs or in both upper and lower extremities, and also with excessive vomiting. The attack in many points greatly resembles that of continuous periodic hypersecretion, and lasts just about as long. Examination of the stomach contents before and during the attack has not revealed anything characteristic (Von Noorden[5] and Ewald[6]).

Besides tabes dorsalis, other lesions of the spinal cord which involve the vagus nucleus may also provoke gastralgia. Thus Leyden[7] describes it among the symptoms of subacute myelitis, and Oser[8] in a case of pressure myelitis. This type of gastralgia accompanying spinal troubles appears of special importance, inasmuch as it is frequently one of the first symptoms of the real trouble. The gastric crises may in some instances precede for several years the other symptoms of locomotor ataxia. It is hardly necessary to mention that in all cases of periodic gastralgia we should examine the condition of the nerves and of the cord (knee reflex, Romberg's symptom, sensitiveness of the skin, and reaction of the pupils).

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[1] Kahler: Prager Zeitsch. f. Heilkunde, Bd. ii.

[2] Demange: Revue de médecine, 1882.

[3] Landouzy et Déjerine: Société de biologie, 1884.

[4] Oppenheim: Berl. klin. Wochenschr., 1885.

[5] C. von Noorden: "Pathologie der gastrischen Krisen." Charité Annalen, 1880.

[6] C. A. Ewald: *l. c.*, p. 403.

[7] E. Leyden: Zeitschr. f. klin. Medicin, 1882, Bd. iv., p. 605.

[8] Oser: "Die Neurosen des Magens," Wien und Leipzig, 1885.

Neurotic Gastralgia.—Gastralgia often occurs as one of the symptoms of either hysteria or neurasthenia. Both conditions are characterized by the peculiar symptoms which, if present in a sufficient number, will make the diagnosis easy. Sometimes, however, the gastralgia may exist for a long time as the only symptom of either neurasthenia or hysteria. It is then more difficult to recognize the real nature of the trouble.

Constitutional Gastralgia.—Constitutional gastralgia is caused by some abnormal condition of the blood, due either to infection, intoxication, or malnutrition. Among the infections, malaria is frequently the cause of intense gastralgia. The gastralgia may be associated with other symptoms of this disease, chills, fever, etc., or it may appear alone. It is characteristic of gastralgia of malarial origin to appear either every day, or every other day, or every third day at the same hour. I have frequently seen this form of gastralgia accompanied by intense vomiting and by a condition of hyperæsthesia of the stomach prevailing in the intervals between the attacks.

The intoxications causing gastralgia are very numerous. Thus chronic lead poisoning, an extensive use of the mercurial preparations, the excessive use of tobacco, frequently evoke typical attacks. Gout is also sometimes found to give rise to gastric attacks. Malnutrition, which is always associated with anæmia, is frequently found complicated with gastralgia, especially in young persons (chlorosis). In these cases it is, as a rule, very difficult to decide whether the gastralgia is due to the anæmia or to a real organic trouble of the stomach, namely, ulcer.

Reflex Gastralgia.—This group occurs more frequently in women. Reflex gastralgia may be caused by abnormal conditions in distant organs, such as the uterus, ovaries, or tubes. In men also diseases of the genito-urinary organs give rise to similar troubles. Another frequent cause of reflex gastralgia is an abnormal position of the abdominal organs. Thus enteroptosis, gastroptosis, nephroptosis, hepatoptosis are all occasionally the cause of gastric pains. Hydronephrosis has also been stated by Renvers[1] to be the cause of gastralgia, and I myself have observed one case of this kind.

Diagnosis.—To establish the diagnosis of gastralgia it is of importance to exclude (1) all organic and functional diseases of the stomach accompanied by pain, and (2) conditions likewise provoking pains in the gastric region which, however, are not due to the stomach.

Among the organic affections of the stomach which give rise to gastralgia, and may occasionally be confounded with idiopathic gastralgia, are: (*a*) Chronic gastric catarrh; (*b*) cancer of the stomach; (*c*) ulcer of the stomach; (*d*) stenosis of the pylorus.

In chronic gastric catarrh the pains are very seldom intense, they have a more continuous character, and do not appear in paroxysms.

In cancer of the stomach the pains may be intense at times, but they are also, as a rule, more steady, never leaving any perfectly free intervals, while in idiopathic gastralgia the pains appear in the form of attacks lasting only several hours and alternating with complete euphoria.

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[1] Renvers: Berl. klin. Wochenschr., 1888, No. 53.

Ulcer of the stomach occasionally presents much more similarity to the affection under consideration. The characteristic signs of ulcer (a circumscribed spot in the gastric region or to the left of the eleventh to twelfth dorsal vertebra, very painful on pressure, the aggravation of the pains after the ingestion of food, especially of coarse substances, a preceding hemorrhage) will, if present, make the differential diagnosis between this affection and idiopathic gastralgia very easy. Sometimes, however, all of the characteristic symptoms mentioned are absent, and then it becomes very difficult to distinguish between these two affections, for there undoubtedly exist ulcers of the stomach which give rise to more or less periodic paroxysms. In these doubtful cases it is advisable to institute the Ziemssen-Leube rest treatment of ulcer, and if this proves beneficial it will speak in favor of the affection having been an ulcer; the failure of this treatment would rather tend to indicate that the affection is nervous gastralgia.

Stenosis of the pylorus is accompanied with typical attacks of gastralgia. When frequent vomiting and ischochymia are present, the differential diagnosis is not difficult. If, however, the two symptoms mentioned are absent, it may sometimes become quite difficult to decide between the two conditions.

In diagnosticating nervous gastralgia, it will be still more important to differentiate between some functional disorders of the stomach which may be associated with pains. Such affections are: (*a*) Hyperchlorhydria; (*b*) periodic and chronic continuous hypersecretion; (*c*) achylia gastrica. In hyperchlorhydria and hypersecretion the pains, as a rule, disappear after the ingestion of food, and even a severe attack may be checked by the taking of some food. In achylia gastrica the pains exist only while there is food in the stomach, but not in its empty condition, while in nervous gastralgia the pains appear independently whether there be food in the stomach or not. Besides these clinical symptoms in all of the functional disorders just mentioned, the exact diagnosis can be made by the results of the examination of the gastric contents.

There are other conditions which also provoke pains in the gastric region, which are not due to the stomach.

Muscular pains of the abdomen, due either to rheumatism or to overexertion, may give rise to mistakes in diagnosis. The pain in these affections, however, does not appear paroxysmally and disappears if due to overexertion when the patient assumes a recumbent position and the abdomen is relaxed.

Neuralgia of the lower intercostal nerves is characterized by extreme sensitiveness on pressure in a certain intercostal space, extending forward from the vertebral column; the pain is more superficial than in gastralgia.

Gall stones frequently give rise to attacks of intense pains which may be mistaken for gastralgia. Whenever there is a distinct history of cholelithiasis (a preceding icterus, the appearance of gall stones in the stools, swelling of the liver) the diagnosis is easy When, however, these characteristic symptoms are absent, then it becomes more difficult to differentiate between gastralgia and biliary colic. The following points will help to establish the differential diagnosis. In gall stones the attack of pain is frequently associated with a rise of temperature. The pains are also felt more intensely to the right of the abdominal cavity (liver). In gastralgia there is, as a rule, no fever and the pains on the right side are not so well marked as in biliary colic. In many instances the diagnosis between gastralgia and biliary colic will remain doubtful, and it is then advisable to institute a treatment which would be suitable for gall stones. The success or the failure of the treatment will aid in the establishment of the correct diagnosis.

Enteralgia or intestinal colic is characterized by the change of the site of the pains from one place to another in the abdominal cavity, while in gastralgia the pain is fixed at one and the same area. Another point in the differential diagnosis between these two conditions is the circumstance that in enteralgia the pain is either relieved or disappears entirely after the passage of flatus. Furthermore, enteralgia is very often the result of irregularities of the bowels, and the condition is therefore ameliorated after these have been regulated.

Renal calculi may also give rise to colicky pains. These are characterized, however, by radiation along the ureter to the bladder. The passage of a small stone or of gravel or of blood clots with the urine will easily establish the true nature of the condition.

Treatment.—In treating a case of gastralgia it is of the utmost importance to recognize the primary cause of this condition. Thus in gastralgia of malarial origin quinine in large doses will be the best remedy, while in that due to chronic nicotine poisoning a cure will be obtained by forbidding the patient to smoke. Gastralgia resulting from chlorosis will have to be treated by the administration of iron, arsenic, bone marrow, and other blood-producing substances. Gastralgia due to hysteria and neurasthenia should be treated by hydropathic methods, massage, and large doses of bromides. Primary gastralgia, or gastralgia in which no etiological factors can be found, is best treated by the application of the galvanic current, either percutaneously or by the intraventricular method. The latter mode of treatment I consider much superior. I would emphasize that methodical application of the galvanic current intraventricularly, administered for a period of from four to six weeks, rarely fails to relieve the most intense and obstinate cases of idiopathic gastralgia.

All the methods of treatment just mentioned have in view the prevention of the attacks. The gastric attacks as such, however, should be treated in the following manner. Pains in the abdomen not very intense in character are frequently relieved by the application of a hot-water bag or a warm linseed poultice, or by the assumption of a recumbent position, and the taking of warm drinks. Hoffman's anodyne (ten to twenty drops) in sugar water or on a lump of sugar, or tincture of valerian (fifteen to twenty drops) may also relieve the pain. If the attacks of gastralgia, however, appear in intense form, the administration of an opiate can seldom be avoided. The best and quickest way to relieve the suffering is a hypodermic injection of morphine (one-sixth to one-fourth of a grain); suppositories of either codeine or opium in combination with belladonna are very useful. I frequently prescribe suppositories of two-thirds of a grain of opium and one-sixth of a grain of belladonna extract, to be taken every two or three hours until the pains cease.

MOTOR NEUROSES.

Physiologically as soon as food has been swallowed and has passed the pharynx, the further motion of the bolus is accomplished without our consciousness. We know from experience that the peristaltic action of the œsophagus carries the bolus to the cardia, which has opened during deglutition, and through it to the stomach. The cardia apparently remains closed, if not all the time, then at least when the stomach is at work. The pylorus is also closed during the act of gastric digestion, and opens at certain intervals, in order to allow portions of chyme to pass. The cardia and pylorus being closed, the anakinesic work of the stomach can go on without difficulty. If one of the arrangements just mentioned is disturbed, then pathological conditions arise. They may consist either in an exaggerated action or in a marked diminution of the work of one of the above functions.

Spasm of the Cardia (Cardiospasmus).

Cardiospasmus represents a condition in which there is a spasmodic contraction of the cardia and the lower part of the œsophagus, causing pain and dysphagia, and not dependent upon an anatomical lesion.

Symptomatology.—Although chewing and swallowing food is accomplished without difficulty, as soon as a few mouthfuls have been ingested a feeling of pressure is experienced in the region of the upper and middle portions of the sternum. The patient feels as if something had remained in the œsophagus. At the same time he has also a slight sensation of dyspnœa. Instinctively the inspirations now become much deeper and the expirations are performed with much force. The latter act frequently causes a regurgitation of the œsophageal contents. As soon as the œsophagus has become empty in this way the patient feels better and the symptoms just described disappear. The same phenomena come into play as often as the patient begins to eat.

Cardiospasmus may appear in an acute form and last only a very short time (one to two days), or it may, in rare instances, exist as a chronic affection and last for many years. In the latter instance it must always be considered as a grave trouble. The chronic form, although originally based on the same derangements, manifests itself in a somewhat different way from the acute variety. The same difficulties (dysphagia) are experienced as described above after the swallowing of food. Instead of regurgitating the food, however, the patient instinctively learns to force it down into the stomach, taking a very deep inspiration and compressing the thorax by muscular action while holding his breath. Liquid and semi-liquid foods are easily forced down into the stomach in the manner just described. Most of the patients learn to ingest even coarse substances; they are obliged, however, to take a few mouthfuls of liquid before they can pass the food into the stomach. As a rule, in all these cases of chronic cardiospasmus the upper part of the œsophagus becomes dilated, and can easily hold from 300 to 400 c.c. That is the reason why patients afflicted with this trouble perform the act of forcing the food farther down, not after every one or two mouthfuls, but rather after having already taken quite a considerable quantity, as the food meanwhile can easily lodge within the œsophagus. As a rule, three or four intermissions are made by the patient during a meal in order to force the food into the stomach.

In some cases the dysphagia is more pronounced on certain days, and less on others. Such patients are occasionally able to take an ordinary meal without the slightest difficulty. As a rule, however, these good days are not numerous. The explanation for this variable condition lies in the assumption that the spasmodic contraction of the cardia alternates with periods of relaxation. These periods of relaxation, however, are found only in cases which are not of long standing. If the condition has lasted for a considerable length of time (one or two years), a *dilatation of the œsophagus* is often the result. As soon as this has occurred, the dysphagia becomes permanent, no matter whether the cardia be spasmodically contracted or not. The same condition—viz., dilatation of the œsophagus—can also be produced, either by paralysis of the œsophagus or by a lack of reflex relaxation of the cardia (or paralysis of the nervus dilatator cardiæ, Oppenchowski). After dilatation of the œsophagus has been established it is generally most difficult to decide whether this is a result of a spasmodic contraction of the cardia or of one of the two conditions just mentioned. The following case[1] well illustrates the latter possibility:

J. W——, 45 years of age, janitor, had typhoid fever twenty-five years ago, since which time he has enjoyed perfect health. In the beginning of March, 1888, the patient fell down in the street, striking his back against a small projection. He arose unaided, and resumed his work without any annoyance. On the following day he had pains in the upper part of his body, especially in his arms; these lasted but a few days and disappeared.

About fourteen days later the patient began to have a feeling of fulness after eating, and had a pressing sensation above the gastric region. Two or three weeks later he noticed some difficulty in taking his food, and tried to assist it by drinking warm water several times during the meal; only in this way did he succeed in enjoying a whole meal.

In May, on account of this pressing sensation, the patient was compelled to leave the table in the middle of a meal and walk up and down the room, making deep inspirations and expirations; he used to press with his hands upon the front of the lower part of his thorax after having made a deep inspiration and closed the glottis. The patient said that these attacks during a meal resembled very much a suffocating condition. The described manipulation usually brought him relief, allowing him to eat again, but then the process repeated itself. In the morning he could eat more easily than at noon-time.

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[1] Max Einhorn: "A Case of Dysphagia with Dilatation of the Œsophagus," Medical Record, 1888. Similar cases have been described by S. J. Meltzer: Berl. klin. Wochenschr., 1888, No. 8, and J. Maybaum: Archiv für Verdauungskrankheiten, Bd. i., Heft 4.

Since June, 1888, the patient has been sleeping very badly (at most three hours during the night). When in bed he had often a sensation as if something would go up and down in the interior of his chest, and when this sensation came on he was forced to cough quite often. From time to time it happened that he awoke, his mouth being full of fluid; also while awake some fluid at times came up into his throat and mouth, this only happening when in the recumbent position. When standing, he was never compelled to empty his throat.

The patient became thin, felt weak and miserable, and soon could partake only of fluid. The sight of solid food enraged him to such a degree that he threw it away with disgust. Even fluid substances were taken only with great difficulty; he used to throw his arms backward, and, standing erect, his head leaning toward the back, after a deep inspiration and with closed glottis he would press firmly. The condition of the patient became worse and worse; he lost forty-one pounds during these few months, and went for aid to the German Dispensary on October 23d, 1888.

Present Condition.—October 23d, 1888: Patient tall in stature and lean; looks pale. The integument can be lifted in large folds. The physical examination of the thorax and the abdomen cannot detect anything abnormal. The heart sounds are normal. Pulse, 70;

respiration, 20; temperature, judging from sensation upon the chest, not increased. The patellar reflex is present, and the patient is able to stand with eyes closed. The urine does not contain any sugar or albumin. The patient complains of not being able to eat any solid food, and of difficulty in taking even fluids, as he cannot get them down. Besides this, he has nearly always a pressing sensation around the chest, coughs very much, and is not able to sleep well.

Examination of the Stomach and Œsophagus.—1. October 25th, 1888, at 8 A.M.: Patient drank coffee one hour before. As soon as a part of the stomach tube was pushed into the œsophagus a coffee-brown liquid was ejected, in which there were some remnants of food and many epithelial cells present. The patient then drank 100 c.c. water. I did not hear any swallowing sound at the ensiform process during the time that the patient drank. On introducing a part of the tube into the œsophagus, water of a neutral reaction came out. Thereupon the tube was pushed farther into the stomach without any resistance, and the patient ejected from his stomach through the tube about 70 c.c. of a coffee-brown liquid. Reaction acid, hydrochloric acid present (phloroglucin-vanillin test), the degree of acidity being 40.

2. November 5th, at 9 A.M.: On account of loss of appetite, the patient had not eaten anything since 2 P.M. of the previous day. The tube was introduced for a length of 46 cm. from the teeth; a pulpy mass (150 c.c.) came out, in which were present small particles of bread; reaction acid, lactic acid present, no hydrochloric acid; acidity = 4. The patient drank 100 c.c. water, the tube was introduced 45 cm., the water came out somewhat turbid by the admixture of mucus and food remnants; microscopically there were many epithelial cells and micrococci. After the water

had come out, the tube, without being taken out, was pushed farther and with but a slight resistance it passed into the stomach; the patient was told to empty his stomach, but only a few drops of clear fluid were obtained. This proved that the stomach was empty.

3. November 8th: The patient partook of breakfast, and then drank water; he was examined an hour later. The tube was introduced for a distance of 36 cm., when there appeared a fluid containing no hydrochloric acid; thereupon the tube was pushed, without any further resistance, into the stomach, and by expression a fine chyme was obtained containing hydrochloric acid and peptone.

4. November 13th: The patient took eggs, coffee, and a little softened white bread; then he administered his method of bringing the food down into the stomach by means of pressing (bringing the muscles of expiration into play, after having made a deep inspiration, with closed glottis). An hour later, shortly before the examination, the patient was told to press several times again. The tube was introduced to a distance of 48 cm., and during expiration only 8 c.c. of a turbid liquid were obtained; there were present very minute pieces of bread and many epithelial cells, but no hydrochloric acid; thereupon the tube was pushed, without any resistance, into the stomach; now there came out a chymous fluid with hydrochloric acid. The patient drank 200 c.c. water; the tube was introduced about 40 cm., and the water came out with a gush.

5. November 16th: Patient took breakfast at home and administered his method of forcing down his food. The œsophagus was examined an hour later and found empty. The pharyngeal vault was tickled with the finger to induce vomiting, but without suc-

cess. Thereupon the tube was introduced into the stomach, and a fine chymous fluid, containing hydrochloric acid, was obtained. The stomach was then filled with air by means of a tube and bulb; the air did not escape along the outside wall of the tube. By keeping the tube open the stomach was emptied of the air; afterwards the lower part of the œsophagus was blown up. A considerable quantity of air could be blown into it without returning, but upon increasing it still more the air began to escape upward through the upper part of the œsophagus, along the outer side of the tube wall. During the inflation of the œsophagus there was observed, at both sides of the vertebræ below the inferior margin of the scapulæ, somewhat more tympanitic resonance, but that was not very decided.

It is evident, from the history of this patient, that the difficulty in bringing the food into the stomach slowly developed a few days after the fall, and finally led to complete dysphagia. The examinations showed that the contents of the stomach were normal. The examinations with the stomach tube show, firstly, that the passage through the œsophagus to the stomach is perfectly free, for the thick tube passed into the stomach without any resistance; secondly, that the œsophagus, in its lower third, must be saccularly dilated, as the distance from the teeth to the cardia (measured with the tube) is 48 cm.; whereas in the case of this patient, even taking into consideration his large frame, it ought normally to be not more than 40 to 41 cm. In this cavity the tube, leaning on the wall of the œsophagus, was compelled to assume with its lower end the form of a semicircle, and thus produce this high figure. That the patient is really unable, in swallowing, to bring even liquids down to his stomach, except by the pressing action, is proven by the fact that swallowed water could always be taken out from the œsophagus by means of the tube, whereas immediately afterward the tube, pushed into the stomach, brought up part of the stomach contents containing hydrochloric acid.

Ewald mentions a similar case, in which the tube passed into the stomach without encountering any resistance at the cardia while the food still remained within the œsophagus. He considers this case as one of spasmodic contraction of the cardia and believes that although no resistance was felt with the tube, still the cardia became contracted during deglutition. I do not think it is necessary to assume that the cardia acts differently during insertion of the tube than while taking food. As I remarked above, the symptom of dysphagia exists as soon as dilatation of the œsophagus has been established, no matter whether the cardia be contracted or not, for the dilated œsophagus cannot contract sufficiently to carry the food into the stomach. In order to accomplish this, other means will be necessary, consisting, as mentioned above, in the compression of the thorax, after a deep inspiration.

Diagnosis.—The diagnosis of the acute form of cardiospasmus is based upon the following points: The existence of dysphagia for a short time, the absence of the swallowing sounds, and the resistance encountered at the cardia on insertion of a tube into the œsophagus—a resistance, however, which can be overcome. It is characteristic of this spasmodic contraction of the cardia that the resistance felt during the introduction of different-sized bougies is the same or rather less for those of large calibre, while in organic strictures of the cardia a thick tube is unable to pass and the thin ones encounter either no resistance at all or glide through with some resistance. The diagnosis of the chronic forms of cardiospasmus can be made if the symptom of dysphagia has lasted for long periods of time (three months to two years) and the examination with a bougie reveals the same condition as described in the acute form.

Dilatation of the œsophagus, which is of so frequent occurrence in this affection, and its most important sequelæ can be diagnosed in the following way: The patient one to two hours after a meal is examined by means of a tube, which is introduced into the œsophagus, and if there be some contents (in the œsophagus) they are withdrawn. The patient now drinks a glassful of water (200 to 300 c.c.) and is told not to perform the forcing motions. After an interval of about five minutes the tube is again inserted into the œsophagus. If dilatation of the latter exists, the water will now appear through the tube in about the same condition as when drank, *i.e.*, not mixed with food. On pushing the tube farther down through the cardia into the stomach, real gastric contents will now appear, showing that the water the patient drank had remained all the time within the œsophagus and had not mixed with the food.

Prognosis.—The prognosis of the acute form is good. That of the chronic form is good *quoad vitam* and bad *quoad valetudinem completam.*

Treatment.—The acute form is best treated by large doses of bromides and by the introduction of largesized sounds. Opiates and chloral hydrate have also sometimes a beneficial effect. In the chronic form, the treatment will consist in the following: 1. The patient is allowed to take only fluid or semi-fluid foods; 2. After every meal he must perform his pressing action for a long time; 3. Every evening, before going to bed, the œsophagus is emptied and washed by means of the tube; 4. The patient introduces the tube into his stomach once every day, in order to relax the cardia. After a while, when the patient feels better, he can begin to introduce greater variety into his diet, and is allowed to eat even solid substances.

Eructation.

The frequent expulsion of gas from the stomach through the mouth is known as eructation or belching. While this condition may accompany the most varied affections of the stomach, it may also occur alone and is then considered as a neurosis. It is characteristic of the latter that the gas expelled has no particular odor and consists principally of air. The eructations of gas may appear in the form of attacks lasting half an hour to an hour or much longer. The intervals between the eructations during an attack are sometimes very short, so that there may occur two or three belching spells in one minute. Sometimes the expelled gas does not come from the stomach, but merely from the œsophagus, and consists of air which has just been swallowed previous to the belching. Some people are able to produce this kind of belching voluntarily. Ewald states that he can belch at will from the œsophagus. By auscultating himself to the ensiform process, he became convinced that the air voluntarily eructated did not come from his stomach, as no sound whatever was audible at the ensiform process. In view of this fact and of the importance of swallowing of air in the production of belching, Bouveret[1] proposed to designate this condition as *aerophagia* (eating of air). I am inclined to think that the frequent eructations from the œsophagus, which are always preceded by acts of deglutition and accompanied by loud sounds, are identical with singultus, and result from a condition of irritation of the phrenic nerves. Attacks of singultus of short duration (ten to fifteen minutes) are of frequent occurrence, while attacks lasting several days without interruption are quite rare. The latter occur either accompanying very grave conditions (cancer of the stomach and some cases of peritonitis) or again as a primary neurosis. Nervous belching may either last several days or exist for years. The patients are never disturbed by the act of belching during sleep, but in the daytime the trouble may sometimes be so annoying as to keep them away from society or even from business. The act of belching is ascribed by some to an increased peristaltic action of the stomach, by some to a decreased contraction or a relaxation of the cardia, and by some to both of these conditions together.

Etiology.—Nervous belching is frequently found in hysterical and neurasthenic persons, but also in people not otherwise showing any neurotic symptoms whatever. It sometimes appears after great mental worry or excitement, or also as a sequel of an acute gastric catarrh.

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[1] Bouveret: *l. c.*, p. 611.

Treatment.—In persons with a weakened constitution, in neurasthenics and hysterical persons, this primary trouble must be treated as such. If the condition is idiopathic, the administration of the bromide salts is very valuable. The faradic current applied intraventricularly has given me very good results in this class of cases. Diet does not seem to have much influence upon the affection. I deem it very important to tell the patient to try and suppress the belching as often as he can. Very frequently this measure alone suffices to effect a cure.

Pyrosis.

By the term pyrosis is designated the ejection of chyme from the stomach into the œsophagus. As a rule, a burning sensation is then felt at the pit of the stomach, which is also known under the name of *heartburn.* While pyrosis is of frequent occurrence in hyperchlorhydria, it may also appear as a neurosis even if the gastric secretion is perfectly normal. It is generally believed that the sensation of heartburn can be produced solely by acid fluids, but the sensation can exist even without the presence of an acid. Thus I have at present under observation a patient with achylia gastrica, in whom the gastric contents are almost always of a neutral reaction and who nevertheless frequently complains of heartburn.

Regurgitation.

Regurgitation denotes a condition in which either liquids or liquids mixed with solid food particles are ejected in small portions from the stomach into the mouth. These contents are, as a rule, spit out; occasionally, however, they are again swallowed. It is generally believed that a relaxation of the cardia is the cause of the trouble. In most instances regurgitation takes place involuntarily, in some, however, the patient is able to produce it at will. In nervous regurgitation the ejected matter does not show any abnormal condition (and does not smell or taste bad). This is different if regurgitation is the result of an organic affection of the stomach. Regurgitation, as a rule, appears soon after meals, and this process may repeat itself quite a number of times in a short period. In most instances this affection does not lead to any serious conditions. Sometimes, however, if regurgitation is very obstinate and large portions of chyme are constantly ejected, serious complications may result from inanition.

The following case, which I have observed, is interesting with regard to this point.

A boy, 8 years of age, had been suffering, as his mother stated, from obstinate vomiting for about three years. The little patient looked extremely pale and emaciated. He had cold extremities, became dizzy quite frequently, especially on rising, and felt very weak, so that a walk of two blocks tired him out. On further inquiry the mother stated that the boy did not vomit a large quantity at once, but brought up small portions of food from the stomach which he spat out. This occurred fifteen to twenty or even more times after each meal. Physical examination of the chest revealed nothing abnormal. The abdomen was slightly bloated; the splashing sound could be produced in the gastric region, extending to two fingers' width below the navel. On palpation no painful spots could be discovered. The patient took a small meal and was observed half an hour afterward. Regurgitation took place while he was in my office. The ejected chyme revealed on examination the presence of free hydrochloric acid in normal amounts. The case was diagnosed as nervous regurgitation, and the extreme degree of anæmia and malnutrition referred to insufficient nutrition on account of the great amount of chyme which was constantly ejected from the stomach and in this way lost to the organism. The little patient was given no medicine, but was told never to spit out the food which came up into his mouth, but rather to swallow it. The mother was told to keep constant watch over the boy, in order to have this rule strictly observed. In about three months the patient began to grow stronger and gained in weight, so that after this time he could hardly be considered sick. Moreover, regurgitation now appeared quite seldom and was then repeated only once or twice.

Etiology.—Regurgitation may develop either in consequence of great mental worry or nervous strain or as a sequel of an acute gastric catarrh.

The *prognosis* is almost always good.

Treatment.—This consists in the application of the faradic current intraventricularly and in the administration of strychnine. In conjunction with these remedies, the patient must be told to suppress regurgitation whenever possible. At first he will often fail to do so, but after a while he will be able to suppress it, and still later the tendency to regurgitation will entirely disappear. In cases in which regurgitation is of frequent occurrence and obstinate, and nutrition begins to be insufficient, it is of the greatest importance to forbid the patient to spit out the ejected food and to tell him to swallow it again. This treatment may occasionally artificially produce the condition which will now be described.

Rumination.[1]

Synonyms.—Merycism, "chewing the cud."

By rumination is designated a condition in which the food returns, without nausea, in small portions, from the stomach through the œsophagus into the mouth, some time after meals; here it is chewed anew and swallowed.

Etiology.—If we are not inclined to accept as the cause of rumination an anatomical alteration in the upper digestive tract—a hypothesis not demonstrated or even rendered probable—two explanations still present themselves, namely, heredity and self-acquisition. But as heredity has been met with in only very few cases of rumination, and thus cannot be taken for the main cause of the affection, it appears of importance to lay most stress on self-acquisition. This may arise, firstly, from imitation; secondly, from necessity and custom (adaptation).

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[1] The history and literature of this affection can be found in my paper: "Rumination in Man," Medical Record, May 17th, 1890.

As the best example of imitation Koerner's[1] case may be cited, where a ruminating governess imparted her own affection to her two pupils; after the governess had been sent away, the two children quickly got rid of their rumination.

In many cases of rumination the patients first, before the beginning of the trouble, had for some time suffered from dyspeptic symptoms with regurgitations; thereafter they commenced to swallow what came up by regurgitation, and, finally, were aware of ruminating. In these cases the development of rumination from slight pathological conditions, by necessity and custom, can be plainly seen.

Most of the reported cases of rumination (in all the literature, to date, but one hundred and six cases have been described) are of the male sex, and belong chiefly to the professional and more educated classes (physicians, philologists, and lawyers); of the female sex only a few cases are reported as ruminants (in all nine cases, figured from the paper of Johannessen).[2]

This alone would not prove that rumination, in fact, appears less frequently in men of the lower class and in the female sex; for very often a man of the working class does not deem his condition as a ruminant to be abnormal, and does not make mention of it to his physician. On the other hand, there are several people (especially among women) who would like to conceal their affection, and therefore do not speak about it. In consequence thereof, the correct relation of rumination, in reference to its distribution among the two sexes and the different social classes, cannot be ascertained from the cases reported in literature.

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[1] Koerner: Deutsch. Arch. f. klin. Medicin, Bd. xxxiii., p. 554.

[2] Johannessen: Zeitschr. f. klin. Medicin, Bd. x., p. 274.

Among the insane and idiots rumination has been found quite frequently. Thus G. Cantarono[1] found nine cases of rumination among four hundred male insane; but among three hundred female insane he found no ruminants. Bourneville and Séglas[2] likewise lay stress on the frequency of rumination in idiots, and also in epileptics.

Duration.—The duration of merycism is very variable; sometimes there is rumination going on uninterruptedly during the whole of life. Often it appears in the forms of attacks, periods of rumination alternating with normal periods of varying duration.

Sometimes rumination suddenly ceases at the occurrence of an important change in the life of the merycist. Thus a case is on record in which a person ceased to ruminate immediately after marriage. But there is also a report of another case in which rumination made its appearance a day after marriage.

These varying circumstances can only prove how deeply rumination is connected with the nervous functions.

Chemical Analysis of the Stomach Contents.—The investigations upon the chemical condition of the stomach in merycists have been made only within the most recent period.

Johannessen says briefly, in his elaborate paper on rumination, that at the end of rumination the ejected materials showed an acid reaction. Alt,[1] in 1888, was the first to make exact examinations of the stomach contents in a ruminant. As soon as the patient suppressed rumination it was found that the stomach contents, obtained three to four hours after a test dinner, contained free hydrochloric acid, were rather hyperacid, and showed very retarded amylolytic qualities. But as soon as the patient had practised his rumination as usual, the stomach contents were less acid and the amylolysis was much better. Alt presumes that the rumination in his patient had the purpose of correcting the fault made by a deficient salivation of the food and the hyperacidity arising from it. "We would seem to have," he says, "in rumination a process for correcting the hyperacidity caused by a deficient salivation and the bad digestion of amylaceous matters." Acting on this theory, Alt treated his patient with alkalies, with the result that the patient was less inclined to ruminate, and further, could suppress the habit much more easily.

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[1] G. Cantarono: Neurolog. Centralbl., Bd. iv., 1885.

[2] Bourneville et Séglas: "Du Mérycisme." Arch. de Neurologie, Paris, 1883.

In favor of Alt's theory would be perhaps the case of rumination reported by W. A. Hubbard.[2] A farmer, aged thirty-five, consulted Dr. Hubbard for, as he expressed it, "the restoration of his lost cud." This patient had had the habit of ruminating his food since a period beyond his recollection, and had always enjoyed perfect health; now, for a month the rumination had stopped, and this was immediately followed by dyspeptic symptoms. All medicaments proved to be of no use. Should we look with Alt upon rumination as a means of correction, it would be very easy to understand why the patient had the dyspeptic symptoms at the cessation of the rumination, and his wish and hope that "his habit will return as suddenly as it left him," justifiable.

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[1] Alt: Berl. klin. Wochenschr., 1888, Nos. 26 and 27.

[2] W. A. Hubbard: Medical Record, July 31st, 1886, p. 122.

Soon afterward, however, Boas[1] published a case of rumination in which the chemical analysis of the stomach contents showed the acidity to be markedly diminished. The treatment consisted in giving the patient hydrochloric acid, and the result was a diminution of the rumination and an amelioration of the glandular function of the stomach. In this way by Boas' case Alt's theory has been refuted. Shortly afterward Juergensen[2] published two cases of rumination, with an absence of the free hydrochloric acid.

In considering the figures of the chemical analysis of the stomach contents of merycists I have observed, I must say that no relationship whatever can be found between the chemical condition of the stomach contents and rumination. In some of the patients the condition of the stomach was perfectly normal in every respect; the chemical analysis showed the presence of hydrochloric acid in a normal quantity; the power of motion also proved to be adequate; Ewald's salol reaction appeared after one hour: in others the chemical analysis of the stomach contents varied greatly on different days. There was found once normal acidity (50), once rather subacidity (40), and once hyperacidity (100), whereas hydrochloric acid was always present. In some, again, there was hyperchlorhydria, while in others achylia gastrica prevailed. The conjecture of Ewald is therefore confirmed. This author, in his book on the "Diseases of the Stomach," says in reference to rumination: "I would not be astonished, the conditions being the same, if varying degrees of acidity were found in the same patient, because such changeable conditions are in the nature of many neuroses." One of my patients (K——) furnished the best example of such an occurrence, and from this we can infer that no connection exists between rumination and the chemical condition of the stomach.

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[1] Boas: Berl. klin. Wochenschr., 1888, No. 831.

[2] Juergensen: Berl. klin. Wochenschr., 1888, No. 46.

During the last nine years I have observed twenty-two cases of rumination. One of the first cases, which I described in the *Medical Record*,[1] was as follows:

March 26th, 1890: G. P——, physician, aged 27, had febris gastrica in his childhood, and in 1884 typhoid fever. Since his ninth year the patient has been troubled with his stomach; at that time, during a period of six months, he usually vomited after partaking of food, especially of fluid. Sometimes the patient had to vomit at the beginning of the meal, immediately after the soup, but could nevertheless continue to partake of his meal directly afterward. Since then his condition has become ameliorated, and instead of vomiting there appeared rumination.

The rumination in this patient appears spontaneously, about one hour after meals, and continues for about a quarter of an hour. The food comes up in small quantities (in the form of boli). The taste is not sour; in chewing the cud the patient has a pleasant sensation.

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[1] Max Einhorn: "Rumination in Man," Medical Record, *l. c.*

When he partakes of liquid food only (as, for instance, beer, bouillon, coffee, milk), there is no rumination.

In this patient the rumination appears periodically; thus, for instance, he ruminated three months, and then was free from the trouble for about a year.

Even during the period of rumination the bowels act regularly; the patient, however, often suffers from belching.

He is able to ruminate at will any time there is food in his stomach. The act of rumination proceeds even then without any effort. In order to effect the rumination the patient closes his glottis and exerts slight pressure over the stomach by means of his abdominal muscles; the contents are then ejected in small portions into the mouth. Patient is able to do this in any posture; when he is sitting or standing, however, it is done with more ease than in a recumbent position. In the same way the patient is voluntarily able to belch and to vomit; the latter in such a way that all the stomach contents are ejected at once. The patient is thus enabled to cleanse his stomach easily; he does this by drinking a large quantity of water and ejecting it immediately after. He also has the faculty of stopping the vomiting at any moment he chooses, and in this way he can alternate vomiting with rumination. He has diplopia and is color-blind in one eye.

The father of the patient and several of his brothers and sisters are troubled with the stomach; the main symptom of their ailment is belching; nobody in the family, however, had ruminated. The patient is able to suppress rumination, not feeling any pain in doing so. He does not know what causes the periodical attacks of rumination, although he has noticed that after any excitement he is more liable to have an attack.

The physical examination shows no abnormal conditions whatever. Patient is of medium height, well developed, somewhat stout. Tongue perfectly clean. The stomach does not seem to be dilated. Seven seconds after swallowing water a rattling sound appears on auscultation at the xyphoid process.

Examinations of the Stomach.—1. During the rumination period, September 15th, 1888. One hour after Ewald's test breakfast: HCl +; acidity = 50; erythrodextrin +; achroödextrin +. On the same day the patient took 1.0 gm. salol in a gelatin capsule; the urine showed the salicyluric acid reaction (it became dark red on addition of a few drops of liquor ferri sesquichloridi) after one hour.

2. During an interval of freedom from rumination, March 25th, 1890. One hour after test breakfast: HCl +; acidity = 54; erythrodextrin +; achroödextrin +. After this examination the patient had an attack of rumination for three days, then it ceased.

Treatment.—Formerly hydrochloric acid, alkalies, narcotics, and bitters were tried empirically now and then, with apparent results for a short time, and sometimes without any influence whatever. Lately the attempt has been made to remedy the error—if any—ascertained after a chemical examination of the stomach contents, and hydrochloric acid or alkalies have accordingly been given, with good results.

Koerner tried giving small pieces of ice immediately after meals, and warmly recommends this method. Washing out of the stomach has been practised by Johannessen, and gavage (feeding through the stomach tube) during fourteen days by Juergensen, but with only temporary relief. All these remedies sometimes effect a temporary amelioration; a permanent cure, however, has never been achieved by therapeutic means. As an exception to this rule we might perhaps consider the moral treatment—*i.e.*, the patient determines not to ruminate and, as soon as a desire to ruminate appears, endeavors to suppress it. Pönsgen[1] mentions two cases of merycism perfectly cured by this method.

This moral treatment can of course be applied more easily in cases in which the rumination can be suppressed by the will power of the patient, although even in those in which the rumination is wholly independent of the will it can also be effected.

In treating Dr. G. P., I made use of this method; he was instructed, as soon as he felt any inclination to ruminate, to try with all his power to suppress it. The patient has carried out this rule quite conscientiously, and the merycism has since that time occurred only occasionally. In the treatment of several other cases I have applied the same method with the best result.

Nervous Vomiting (*Vomitus Nervosus*).

The process of vomiting serves to empty the stomach of its contents by the shortest way, that is, through the œsophagus and mouth. The mechanism of this action is very complicated and a large number of striated and non-striated muscles participate in it. At first the abdominal muscles and the diaphragm contract and compress the abdominal cavity; then the stomach contracts and the pylorus closes firmly. At the same time the longitudinal fibres of the lower end of the œsophagus contract and open the cardia; the pressure which is exerted by the stomach upon its contents throws them into the open œsophagus, which becomes wider and shorter by the contraction of its longitudinal fibres. The epiglottis turns upon the larynx and closes up this canal, while the soft palate rises and covers the posterior nares. Both these actions serve to prevent the contents from reaching either the larynx or the nasal cavity. The only canal which remains open is the mouth. From the œsophagus, by an antiperistaltic contraction of the same, the contents are quickly emptied through the mouth. It is generally believed that there exists a centre for the act of vomiting in the vagus nucleus. It may even be that the respiratory centre and the centre for vomiting are situated at one and the same spot.

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[1] Pönsgen: "Die motorischen Verrichtungen des menschlichen Magens," Strassburg, 1882, p. 127.

Vomiting may be a consequence of various pathological conditions of the stomach, or may be due to an abnormal state of the food. Nervous vomiting is characterized by the absence of either of the two conditions mentioned.

The vomiting may be due to some spinal or cerebral irritation, or may originate reflexly from abnormal conditions in other organs (pharynx, œsophagus, larynx, palate, kidneys, liver, peritoneum, genital organs, etc.), or it may be due to neurasthenia or hysteria. Among these different kinds of nervous vomiting juvenile vomiting and the periodic vomiting of Leyden[1] deserve special consideration.

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[1] E. Leyden: *l. c.*

Diagnosis.—The diagnosis of nervous vomiting has a twofold object in view: (1) To recognize the nervous character of the condition, and (2) to reveal, if possible, its cause. Stiller[1] gives the following points as characteristic of nervous vomiting: It occurs easily, without any effort and without any preparatory stage. It is, as a rule, independent of the quality and quantity of the ingested food. Other points he mentions are: The capriciousness with which certain kinds of food (sometimes very easily digestible) are ejected, while other indigestible substances are well borne; the faculty which sometimes exists in selecting only one certain substance from the various food-stuffs present in the stomach for the vomiting; the carelessness with which the patients bear this condition for a long time; the very slight or hardly marked degree of inanition, notwithstanding the long duration of the ailment. The vomiting is not always dependent upon the meals, but may occur occasionally in the fasting condition. There exist other neuropathic symptoms, which may be associated with the vomiting or alternate with it—the influence which psychical conditions exert upon the vomiting. To these points Boas[2] adds another one, namely, normal secretory and motor functions of the stomach. I agree, however, with Bouveret that, while this may be present in some cases, there certainly occur cases of nervous vomiting in which the gastric secretory function is greatly diminished or even absent.

Juvenile Vomiting.—This condition occurs in young persons attending school, especially if they are overworked. Symptoms of cardialgia and vomiting develop, the latter appearing either once or twice every day, or presenting a rather periodic character. Occasionally there is a train of the following symptoms associated with this vomiting: severe headache, marked pallor, very slow pulse, and dilated pupils. The diagnosis of this form of vomiting is easily made by the symptoms just mentioned. The best treatment is the temporary removal of the patient from school, and a good, strengthening diet.

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[1] Stiller: "Die nervösen Magenkrankheiten," Stuttgart, 1884.

[2] Boas: *l. c.*, p. 238.

Periodic Vomiting (Leyden).—Leyden first described periodic vomiting, which is characterized by the following points: 1. It appears in apparently healthy individuals; 2. The paroxysms occur periodically after intervals of equally long duration; 3. When the attack is over, the patient is perfectly well and no gastric symptoms persist.

The attack is very similar to that of acute succorrhœa gastrica continua, and may be described as follows: In the midst of perfect health the patient experiences for a short time uneasy sensations (slight headache, nausea, slight chilly feeling) which are followed by vomiting. At first the entire gastric contents are ejected; later the vomited matter consists of mucus, alone or with admixture of either bile or shreds of blood. The latter is more frequently found if violent retching has preceded the act of vomiting. Frequently, although not always, there exist an intense pain in the epigastric region and a sensation of utter prostration. The abdomen is, as a rule, sunken and the extremities are cold. At this time no food whatever is borne by the stomach; even a drink of water is very soon ejected. This condition of utter irritability of the stomach and persistent vomiting may last from one to ten days, when suddenly the disturbances disappear, the nausea subsides, and a feeling of hunger returns, which can be satisfied with impunity. All kinds of food are now well borne by the stomach, which but an hour before could not retain the lightest food.

The periodic vomiting of Leyden is a rare affection, and it does not seem to me that the condition of the gastric secretion plays an important part in its causation. While most of the cases mentioned in literature seem to have been associated with a normal condition of the gastric juice, I have observed a case of periodic vomiting in a patient who was affected with achylia gastrica. This patient (J. S.), thirty-seven years old, had been troubled for the last six years with periodic attacks of vomiting, which appeared once in either six or three months and lasted from four to five days. During the intervals the patient could partake of all kinds of food without much inconvenience. The only complaints referred to were frequent belching and constipation. During the attacks the patient could not ingest anything for the entire five days and as a rule presented the most alarming symptoms. I examined him frequently during the intervals and also during the attacks and never found any traces of gastric juice in the contents.

The treatment consists in absolute rest, in the administration of ice pills, and in the use of morphine (subcutaneous injection) or of opium in the form of suppositories. During the intervals between the attacks a sojourn in the country and hydropathic procedures may prove of value.

Reflex Vomiting.—Nervous vomiting frequently occurs as a result of derangements of various other organs. Thus abnormal conditions of the pharynx, an elongated uvula, disorders of the genito-urinary organs may be associated with vomiting. The vomiting of pregnancy must also be considered as belonging to this group. Floating kidney, hydronephrosis, hepatoptosis may likewise be the cause of vomiting.

The treatment of this class of cases will have to be directed toward the seat of the original trouble. An elongated uvula must be amputated, and ptosis of the different abdominal organs must be remedied by keeping them in place by means of a suitable bandage. All the genito-urinary disorders should be treated as such. The vomiting of pregnancy must be considered as a physiological phenomenon as long as it occurs during the first months of pregnancy and appears only once or twice a day, not interfering much with the general nutrition. In this case it is hardly necessary to use any therapeutic means. If, however, the vomiting appears more frequently and obstinately, so that the patient begins to lose in weight, then we have the following remedies at our disposal: Bromide of sodium, 1 gm. (gr. xv.), to be taken twice daily; cerium oxalate, 2 dgm. (gr. iii.) three times daily.

℞ Menthol,	1.0
Aq. dest.,	100.0
Spir. frument. rectif.,	50.0
Syr. zingib.,	30.0

D. S. One tablespoonful four times daily.

Other remedies, such as cocaine, codeine, belladonna, or chloral hydrate, may occasionally be useful. If medicinal treatment fails, then a change of surroundings, as a sojourn in the country, may be tried. If all these means prove useless and the vomiting continues undiminished, so that the life of the patient is in danger, then as *ultimum refugium*, artificial abortion has to be resorted to.

Idiopathic Nervous Vomiting.—Besides the above-named two groups of vomiting, namely, the juvenile and the periodic, which appear without any apparent cause, there exist cases of vomiting in adults which do not show any periodicity. The vomiting occurs, as a rule, after meals. Usually only a portion of the meal is ejected; occasionally, however, the whole meal may be vomited. The vomiting may exist for months and sometimes even for years without remission. The nutrition, as a rule, in these instances is not disturbed. Neurasthenic and hysterical individuals form the greater contingent of sufferers from this form of vomiting. Sometimes, however, persons with an apparently normal condition of their nervous functions may be affected with this trouble, which is by far more frequent in women than in men.

The *treatment* consists in regulating the mode of life of the patient and in advising him to suppress vomiting whenever possible. In neurasthenic and hysterical patients the treatment must be directed against the original trouble; in others change of climate may be tried. Of medicines the bromides play a great part. Arsenic and iron are useful in many instances. In severe cases of vomiting, feeding through the tube for a period of two weeks may be resorted to. During this time no food is to be taken in any other way. When this period is over, then small quantities of food are administered per os, besides continuing the gavage (feeding through the tube). If the food which is taken by the mouth is no longer vomited, then after a while gavage may be discontinued and the feeding done in the natural way. Intragastric faradization may also prove useful. Several cases have come under my observation in which nervous vomiting, after having lasted for many years and resisted the most diverse modes of treatment, has been perfectly cured by the faradic current.

Pneumatosis.

Under the name gastric pneumatosis are classified a group of cases in which the stomach is distended with gas (air), giving rise to a sensation of marked tension and frequently also to shortness of breath (asthma dyspepticum, Henoch). It is generally believed that a spasmodic contraction of both the cardia and pylorus is partly the cause of this condition. This affection may appear periodically or exist constantly. It is often found associated with other symptoms of neurasthenia or hysteria; occasionally, however, it is met with alone. In typical cases of pneumatosis the epigastric and gastric regions are found greatly protuberant, sometimes the upper part of the abdomen looks like a balloon. On percussion this area gives a highly tympanitic sound. The patients experience a sensation of distention and marked want of air; sometimes a feeling of utmost anxiety is also present.

Belching, as a rule, cannot be produced by these patients.

In making the diagnosis of this condition, it will be necessary to exclude organic affections of the stomach which may give rise to similar symptoms. In the latter, however, the gas accumulated in the stomach will have a foul odor.

The *treatment* consists in a general tonic regimen of the nervous system and in the administration of the bromide salts. An acute attack of pneumatosis can be checked in the quickest and easiest way by the introduction of a tube into the stomach, so that the imprisoned air can find an exit. The symptoms of tension then disappear at once. This procedure must be repeated whenever a considerable quantity of gas has accumulated in the stomach and given rise to the characteristic symptoms. If a tube is not at hand, or its introduction be inadvisable, the attack may be relieved by a subcutaneous injection of morphine (Ewald). The extract of Calabar bean may also be found very useful.

Hypanakinesis Ventriculi.

I have applied the term hypanakinesis to a condition in which the mechanical function of the stomach is greatly reduced. If tested with the gastrograph there are found only three or four "breaks" and "makes" of the current marked within three minutes. Sometimes no current changes whatever are observed within the same time. I have noticed this condition several times in gastric ulcer, but twice also in persons in which the diagnosis of gastric ulcer could be excluded. One of the latter usually complained that he experienced the most disagreeable sensation soon after meals when resting quietly. He felt relieved only when walking about for three-quarters of an hour or an hour after each meal. It may be that the exercise which the patient instinctively resorted to served to supplement the mechanical work of the stomach that was lacking.

Hyperanakinesis Ventriculi.

In contrast to the above, hyperanakinesis ventriculi denotes a condition of too strong mechanical action of the stomach. The gastrograph shows forty to eighty "breaks" and "makes" of the current within three minutes. This symptom is frequently found to be present in cases of obstruction at the pylorus, but may occur in other conditions. In several of my cases this symptom was associated with hyperchlorhydria.

Peristaltic Restlessness of the Stomach (Kussmaul[1]), *Tormina Ventriculi Nervosa.*

Under this heading are grouped those cases in which there is not only an increased motor (mechanical) activity of the stomach, but in which the peristaltic movements are distinctly visible.

In this condition the peristaltic action of the stomach is remarkably active. High waves can be seen moving along the stomach from left to right. The time required for one wave to pass from the extreme left to the pylorus is about one minute. This visible peristaltic action of the stomach is more pronounced when it is filled with food. In some instances the exaggerated peristalsis is felt by the patient as a slightly painful contraction. In other instances it is not perceptible to the patient. Peristaltic restlessness of the stomach is usually found in dilated stomachs with obstruction of the pylorus. Here it signifies the effort which the stomach makes to overcome the undue resistance which the contents find in passing through the stenosed pylorus. In rare instances peristaltic restlessness of the stomach may occur alone without any obstruction of the pylorus, in that case being a pure neurosis. Kussmaul has described two such cases of nervous origin. I have had the opportunity of observing eight cases of peristaltic restlessness of the stomach in stenosis of the pylorus (seven cases of cancer and one case of benignant stenosis) and only one case of nervous origin. The latter was in a man, forty-two years old, who presented distinct symptoms of neurasthenia and complained of a moving cramp-like sensation, which usually appeared soon after meals in the gastric region and lasted for half an hour or longer. On inspecting his abdomen half an hour after a light meal, small "mountainous waves" could be seen moving from left to right over the gastric region. In this case the greater curvature of the stomach extended to one finger's breadth above the navel (gastrodiaphany) and the stomach was usually found empty one and a half hours after a test breakfast.

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[1] Kussmaul: "Die peristaltische Unruhe des Magens." Volkmann's Samml. klin. Vorträge, No. 181, 1880.

The *treatment* of this affection, if associated with pyloric obstruction, must be directed against the latter primary trouble. In cases of neurotic origin, our therapeutic measures will have to be directed against the nervous system. Massage, hydrotherapy, electricity (percutaneous or intragastric faradization), change of climate and surroundings will frequently prove useful. Larger doses of potassium bromide and codeine, either alone or with belladonna, are often beneficial.

Antiperistaltic Restlessness of the Stomach.

Glax,[1] Schütz,[2] and Cahn[3] have described cases in which the waves over the stomach moved from right to left, and they therefore designated this condition as "antiperistaltic restlessness of the stomach." Glax's case was of neurotic origin. In making the diagnosis of peristaltic or antiperistaltic restlessness of the stomach it is of the greatest importance to determine that the visible waves originate within the stomach and not in the intestines. Peristaltic and antiperistaltic movements of the small intestines are frequently observed and can easily be distinguished from motions of the stomach by the forms presented by the waves. If they originate in the small intestines, they are of small calibre (sausage-like) and are seen moving in different directions and over different regions, while the waves produced in the stomach are nearly always quite large (hand-size) and always move, if peristaltic, from left to right, if antiperistaltic from right to left, in the upper part of the abdominal cavity.

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[1] Glax: Pest. med.-chirurg. Presse, 1884.
[2] Schütz: Prager med. Wochenschr., 1882, No. 11.
[3] Cahn: Deutsch. Arch. f. klin. Med., 1884, p. 402.

Incontinentia Pylori (*Incontinence of the Pylorus*).

Incontinence of the pylorus was first described by L. de Séré[1] and later by Ebstein.[2] The pylorus may be incompetent, first, when unyielding neoplasms involve this portion of the stomach; secondly, when the pyloric sphincter is in an atonic condition, *i.e.*, when the pylorus is apparently always open by reason of some nervous derangement. Ebstein diagnoses an incontinence of the pylorus if on inflating the stomach with air the latter rapidly passes into the intestines, so that it becomes impossible to fill the organ with gas. Instead of the stomach, the small intestines then become filled with air and give tympanitic sounds on percussion. Ewald justly doubts the accuracy of this diagnostic means. He has, indeed, never observed this symptom. In all the cases in which he had distended the stomach to its utmost extent with air, he could never demonstrate that the air passed into the intestines. Whenever the tension became too great, the air always escaped upward through the cardia with eructation. My own experience coincides with that of Ewald. Incontinence, or rather relaxation of the pylorus, is a rare condition, and we are able to recognize it, not so much by the fact that food and gas pass from the stomach into the duodenum more rapidly than normally, as by the regurgitation of intestinal contents into the stomach. The presence of the latter condition is shown by the fact that on washing out the stomach in the fasting condition, more or less large quantities of intestinal juice and especially of bile almost always appear. While the occasional regurgitation of intestinal secretion into the stomach may occur as a consequence of irritation caused by the tube when lavage is applied, still the quantity of the intestinal juice is always small. In incontinence of the pylorus, the quantity of regurgitated intestinal juice and bile is considerable and always present in the fasting condition at each washing of the stomach, and sometimes also if the contents of the organ are withdrawn one hour after the test breakfast or three to four hours after a test dinner. Whether the condition in which the stomach becomes empty more rapidly than normally is to be referred to a relaxation of the pylorus, or to an increased motor function (hyperprochoresis) of the organ, is still undecided. In most instances, however, it seems to me that the latter factor is the more probable. I have observed two cases of relaxation of the pylorus, and both have been treated by intragastric faradization with good results. Occasionally relaxation of the pylorus is combined with relaxation of the cardia, as the following case well illustrates:

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[1] L. de Séré: "Du Relachement du Pylore." Gaz. des hôp., 1864 No. 62.

[2] Ebstein: Deutsch. Arch. f. klin. Medicin, Bd. 26, p. 295.

Miss Emma M——, 24 years of age, suffering for three years from loss of appetite, eructation, constipation, and poor sleep; there was no vomiting but belching of acid fluid after meals. One of the worst complaints of the patient was of this highly annoying ructus, which never left her, and in consequence of which she was hampered in her occupation and frequently kept away from society.

Present Condition.—Tongue thickly coated; splashing sound from the stomach to a point two fingers' breadth below the navel; the right kidney is clearly palpable and easily moved. Examination of the stomach in the fasting condition by means of a tube shows that there is bile mixed with gastric juice in the stomach; also after the test breakfast the contents of the stomach were usually found mixed with bile, as will be seen from the following memorandum:

One hour after the test breakfast: HCl +; acidity = 68; admixture of bile.

When fasting, the stomach contains 70 c.c. of an intensely yellow-colored fluid (bile present); HCl +.

The treatment consisted in direct gastro-faradization and once in a while washing of the stomach. During the month of April the faradization was applied every other day, and the lavage of the stomach once a week in the fasting condition. The patient felt better after a few days' treatment; the eructation disappeared almost entirely, and she could eat with good appetite, having no distress afterward.

Subsequently the faradization was applied once a week and then discontinued. The patient gained several pounds during the treatment, and has been pretty free from complaints since that time.

Pylorospasmus.

A spasmodic contraction of the pylorus without organic disease has been described by Bentejac.[1] He reports the following case:

A man, 59 years old, swallowed a glassful of kerosene by mistake. After this accident he was troubled with intense pains in his epigastric region, but never vomited blood nor did he pass blood with his movements. At the end of eight months there was incessant vomiting and the dilated stomach extended below the navel. Stenosis of the pylorus was diagnosed, and Richelot performed an exploratory laparotomy, but found the pylorus perfectly smooth and normal. The result of the examination during the operation proved that the pylorus was only spasmodically contracted. The operation, however, had the result that the patient ceased to suffer from vomiting, which must be ascribed merely to the suggestive effect of the procedure.

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[1] Bentejac: Thèse de Paris, 1888.

Pylorospasmus is frequently found in association with ulcer, either of the pylorus or of its immediate neighborhood, and must then be considered as a reflex neurosis. The symptoms produced resemble in most instances a real stenosis of the pylorus; and if several attempts to improve the condition have totally failed, then surgical interference must be resorted to. Bouveret[1] states that pylorospasmus frequently occurs in cases of hyperchlorhydria and especially of hypersecretion. The fact that in these cases the pyloric region is sometimes found to be painful and very tender on pressure, Bouveret refers to an undue spasmodic contraction of the pylorus. I must say that this symptom alone is not sufficient to warrant the assumption of pylorospasmus. The pains which are felt more to the right side may be caused by the undue irritation which too acid chyme exerts during its passage through the pylorus.

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[1] Bouveret: *l. c.*

Atony of the Stomach.

Synonyms.—Gastric insufficiency (Rosenbach[1]); myasthenia ventriculi (Boas).

Atony of the stomach designates a condition in which the muscular action of the organ is retarded and weakened. It occurs as a frequent complication of many digestive disorders, and also of other diseases which greatly weaken the constitution. Thus we find it accompanying chronic gastric catarrh, hyperchlorhydria, neurasthenia gastrica, tuberculosis of the lungs, grave heart affections, and the like. Sometimes, however, this condition exists as a primary neurosis.

Symptomatology.—If atony occurs as a complication to another affection, the symptoms of atony will be overshadowed by those of the principal trouble. If it exists alone, the following characteristics are frequently present. An uncomfortable feeling of fulness appears after meals; often there is eructation of gas; the appetite is diminished; headaches and constipation are frequently present.

Diagnosis.—The diagnosis is based upon the presence of the above-described symptoms and the detection of the following points on examination:

1. The splashing sound is easily produced in the gastric region, even if the stomach contains only a small quantity of chyme or liquid. As a rule, the area over which the splashing sound can be produced extends from the margin of the ribs on the left side to the umbilicus or somewhat below it.

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[1] Rosenbach: Volkmann's Samml. klin. Vorträge, 1878, No. 153.

2. Six to seven hours after Leube's test dinner, the washing out of the stomach reveals the presence of a more or less considerable quantity of chyme; while the stomach is found empty in the morning in the fasting condition.

3. On filling the stomach with water, the greater curvature will descend lower and lower as water is added. This symptom, however, which has been described by Pacanowski[1] and Boas, is not constant and therefore not reliable.

The *prognosis* of atony of the stomach is not bad, as the affection is quite amenable to treatment.

Treatment.—A hygienic way of living and a strengthening régime should be advocated. Too much brain work should be forbidden, and plenty of outdoor exercise and frequent bodily ablutions are to be enjoined. Slow eating and thorough mastication of the food are of the greatest importance. The quantity of fluids should be restricted. Not more than from one to one and one-half quarts of liquid, including tea, coffee, milk, and soup, should be given daily. As a rule it is best to have the patient take five meals a day. The diet should consist of light solid food (bread and butter, eggs, mashed and baked potatoes, farina, hominy, soup with vermicelli), tender meat (tenderloin steak, lamb chops, roast beef, chicken, squab), fish, oysters; spinach, asparagus, green peas, carrots; tea, coffee, or cacao (with sugar and milk) in small quantities; a small quantity of beer or ale. Of medicaments strychnine ranks highest. I frequently give tincture nux vomica and fluid extract of condurango equal parts, twenty drops three times daily. The administration of ferratin ½ gm. three times daily may also frequently be found useful.

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[1] Pacanowski: Deutsch. Arch. f. klin. Medicin, Bd. 40.

Electricity, especially intragastric faradization, seems to me to be of the greatest value, in order to strengthen the muscular apparatus of the stomach. With regard to lavage, I concur with Boas that its use is not indicated in this affection.

The constipation, which is so frequently present, is best treated by having the patient partake of plenty of green vegetables, brown and Graham bread, and plenty of fruit; he should be instructed to go to the closet in the morning always at the same time. If these means, however, do not suffice, then I frequently order the following pills:

℞ Podophyllin,	0.3
Extr. nuc. vom.,	
Extr. fab. calab.,	āā 0.5
Extr. gentian.,	
Pulv. glycyrrhizæ,	āā q. s.

M. et ft. pil. No. 30. S. One pill twice a day.

Instead of this pill fifteen to twenty drops of the fluid extract of cascara sagrada may be given twice daily.

SECRETORY NEUROSES.

The existence of secretory nerves governing the glandular secretion of the stomach is generally accepted as a fact, although they have not as yet been demonstrated experimentally beyond a doubt. Several physiological facts speak in favor of this view: A piece of meat held before the eyes of a dog provided with a gastric fistula produces a flow of gastric juice.

The same phenomenon has been observed by Richet[1] in the case of a man with a gastric fistula. Fear and great anxiety have a depressing effect on the gastric secretion. These facts clearly show the influence of nerve centres within the brain upon the gastric secretory function. There must, however, undoubtedly exist some nerve mechanism within the stomach itself which regulates the secretion; for after section of the vagus and sympathetic nerves supplying the stomach, the latter organ will continue to produce its ordinary secretion after the application of an irritant. As in the neuroses previously considered, conditions of increased and decreased functions exist also in these cases.

After having described the functional disorders of secretion under special chapters (Hypersecretion and Achylia Gastrica), we need say here only that in most instances these affections are of nervous origin, either protopathic or of a reflex nature. This latter theory has been especially advocated by Charles G. Stockton,[2] of Buffalo.

Frequently, however, disorders of secretion may secondarily accompany primary neuroses; thus tabes dorsalis and other spinal lesions are frequently associated with hyperchlorhydria and also with periodic gastrosuccorrhœa.

Neurasthenia and hysteria may be complicated with either hyperchlorhydria or hypochlorhydria or achylia. The symptoms which these secretory disturbances evoke are the same as if they were the primary affections.

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[1] Ch. Richet: "Du Suc gastrique chez l'Homme et les Animaux," Paris, 1878.

[2] Charles G. Stockton: Medical Record, 1894.

Hypochlorhydria of nervous origin is sometimes met with without the association of other nervous symptoms, and it is then quite difficult to establish the diagnosis between this affection and gastric catarrh. Absence of tenderness on pressure in the gastric region and a perfectly clean tongue point rather to the presence of a neurosis. Sudden changes in the condition of the gastric secretion speak likewise in favor of a neurotic character.

Nervous Dyspepsia[1] (*Leube*).

Leube[2] originated the name of nervous dyspepsia (neurasthenia gastrica of Ewald) to describe a condition characterized by manifold subjective symptoms, which appear during the act of digestion, but cannot be referred to any abnormal condition in the organ susceptible of objective demonstration. All cases in which dyspeptic symptoms existed and in which after a test dinner hydrochloric acid was detected and the organ was found empty seven hours after this meal, Leube diagnosed as nervous dyspepsia. Later, when attempts were made to estimate the degree of acidity quantitatively, all the cases of hyperchlorhydria had to be separated from this condition. For here the subjective complaints of the patients could be referred to the abnormal condition existing in the undue secretion. Nervous dyspepsia may best be characterized by the existence of manifold clinical symptoms, without any organic lesion whatever.

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[1] Nervous dyspepsia is in reality a *mixed neurosis* in which the sensory, motor, and secretory nerve mechanism, either combined or alternately, may play a part.

[2] Leube: "Ueber nervöse Dyspepsia." Deutsch. Arch. f. klin. Medicin, Bd. 23, 1879.

Etiology.—The disease appears more frequently in men than in women. Although it may occur at the most diverse ages, still the years between thirty and forty-five show the greatest frequency. Many debilitating conditions give rise to the development of this trouble: chlorosis, lung troubles, grippe, malaria; abnormal conditions of the genito-urinary organs, sexual excess, excessive use of tobacco and alcohol predispose to this affection. Organic troubles of the stomach, such as ulcer or chronic gastric catarrh, may also give rise to this complication. It is hardly necessary to say that both neurasthenia and hysteria are often complicated with nervous dyspepsia, or, speaking more correctly, the nervous dyspepsia in reality forms a part of these two conditions.

Symptomatology.—The appetite is generally irregular and capricious. Sometimes it is increased, more frequently, however, it is lessened. The tongue, as a rule, is clean and only occasionally slightly coated. Very soon after a meal various symptoms appear: slight pains in the gastric region, frequent belching, sometimes an irresistible desire to sleep, occasionally a feeling of burning in the head, especially in the forehead. All these disagreeable sensations frequently last as long as there is food in the stomach. Sometimes, when the stomach is empty, a weak feeling and slight dizziness overcome the patient, so that there is really no time whatever during which the patient feels perfectly well and enjoys the feeling of a healthy person. This explains the marked depression existing in these patients. Most of them look at everything from the darkest point of view, and any small inconvenience, which would hardly be noticed by a healthy person, may give them great anxiety and fear. At first the nutrition of the body appears to be in good condition. But sooner or later the patient begins to lose in weight, the sleep is also very soon impaired, and all the symptoms are aggravated.

Besides the gastric symptoms there are also manifold symptoms which refer to the intestines. Sensations of fulness or of tension, and sometimes also pain, are experienced in different regions of the abdomen. Frequently these abnormal sensations are caused by an accumulation of gas in the intestinal tract and relief is felt after the passing of flatus. The bowels are almost always constipated. The movements sometimes appear in the form of small balls and occasionally in the form of a very thin long cylinder the size of a quill. The latter is always the result of the spasmodic form of constipation. Diarrhœa is very seldom met with in this disease.

Burkhart[1] has described the existence of certain points in the abdomen which are painful to pressure, and believes them to be characteristic of this affection. Leven[2] likewise attributes great importance to the appearance of these painful spots, which he ascribes to an irritation of the solar plexus. He describes three such painful areas, one immediately below the ensiform process, the others near the navel, especially to the left of it. Ewald, Richter,[1] and Bouveret are of the opinion that this symptom is by no means characteristic of nervous dyspepsia, as they have met with cases of the affection in which no such painful points could be found. The condition of the gastric juice does not present anything characteristic of this affection. Frequently the juice will be found normal. Sometimes the degree of acidity will be diminished and occasionally increased. In many cases the condition of the gastric juice will reveal manifold variations from time to time. I agree with Bouveret that more frequently a diminished acidity is met with in this affection. If the affection has lasted quite a while, atony of the stomach is usually present. In women enteroptosis very frequently occurs as a complication. In both sexes, but more frequently in the female, membranous colitis may develop in consequence of the high degree of constipation and of the irritation of the colon through scybala. Besides all these symptoms, which refer to the digestive tract, manifold nervous symptoms usually occur: headache, insomnia, pains in the back, frequent emissions, sometimes impotence, vertigo, palpitations of the heart after slight exertions or after meals, feeling of extreme weakness, loss of energy and ambition, etc.

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[1] Burkhart: "Zur Pathologie der Neurasthenia gastrica," Bonn, 1882.

[2] Leven: "Estomac et Cerveau," Paris, 1884.

The *prognosis* of neurasthenia gastrica is quite uncertain. Cases of a slight nature may sometimes resist the best kinds of treatment for a long time. On the other hand, cases of a severer nature may readily yield to rational treatment. The duration of the disease can very seldom be foretold, and although life is not directly endangered, still instances of fatal issue even without apparent complications have been reported in literature.

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[1] Richter: Berl. klin. Wochenschr., 1882.

Diagnosis.—The presence of symptoms of general neurasthenia, and especially of those attributable to the digestive tract without the existence of a real organic trouble, will establish the diagnosis. The principal characteristic of this affection is the lack of proportion between the multiform complaints and the results objectively found in an examination of the digestive organs. Another point of value is the circumstance that different kinds of food, even indigestible substances, do not seem to aggravate the condition, nor does very light food ameliorate it, while changes of climate or surroundings or sometimes pleasant news and the like, may suddenly check all the unpleasant sensations for a considerable time.

Differential Diagnosis.—Neurasthenia gastrica may occasionally be confounded with chronic gastric catarrh, ulcer of the stomach, or cancer, the more so as all these organic affections of the stomach are frequently associated with nervous symptoms. The following points will serve to differentiate between neurasthenia gastrica and the affections mentioned: in neurasthenia gastrica the nervous symptoms (referring to the stomach and to other distant organs) play the most important part. While the different complaints are connected more or less with the digestive tract, the quality and quantity of food do not seem to be of great importance. Sudden changes in the condition of the patient, who feels entirely well for a few days and then again utterly disabled, are characteristic of neurasthenia gastrica. Chronic gastric catarrh will be easily recognized by the constancy of the symptoms, which are aggravated by errors in diet, and by the condition of the gastric secretion (diminished acidity, large quantity of mucus, etc.). In ulcer of the stomach we shall always find some of the characteristic points (circumscribed painful spot, vomiting, hæmatemesis or melæna, pains after the ingestion of food, as a rule very intense). As is well known, however, an ulcer may exist without any of these characteristic symptoms, and it therefore becomes very difficult to exclude its presence, the more so as neurasthenia gastrica may complicate this affection. To establish the differential diagnosis between neurasthenia gastrica and cancer of the stomach, it is often necessary to have the patient under observation for quite a period of time. Whenever there is a tumor or other distinct symptoms of cancer, it is easy to recognize the cancerous affection. If, however, marked symptoms are absent (during the first period of the disease), the differential diagnosis is difficult. In cancer of the stomach there will also be some relation between the quality and quantity of the ingesta, and the existing disturbances. Moreover, in cancer of the stomach there is progressive aggravation of the trouble, while in neurasthenia gastrica the condition may remain stationary for a long period of time.

Treatment.—In all cases in which some connection can be found between this affection and other existing ailments, the treatment must be directed against the latter. If neurasthenia gastrica exists alone, then therapeutic means must be resorted to which will strengthen the entire nervous system. Change of climate, outdoor life, entire relief from business cares, are of great importance, and sometimes sufficient to cure the patient. The diet should be ample, and it is of importance to impress upon the patient the necessity of taking plenty of food. As to the digestibility of different kinds of food in this affection, the patient's own judgment and experience are the best guides to follow. Condiments should be taken moderately and the use of wine, tea, coffee, and beer in small quantities is allowable. In patients who have greatly emaciated, Weir Mitchell's rest cure is often followed by the best results. The direct means which serve to strengthen the nervous system are the following: 1. Hydrotherapeutic measures of a mild nature (wet cold pack, lukewarm sitz bath). 2. Massage of the entire body, to which special massage of the abdomen may be added. 3. Electricity; general faradization of Beard and Rockwell;[1] the patient sits barefooted on a large plate electrode, while the other electrode is passed by the physician over the chest, back, and extremities—electric bath. 4. Both sleep and rest should be accorded to the patient in a large degree. While gymnastic exercises are beneficial, they should never be indulged in to such an extent as to tire out the patient.

With reference to the local treatment of the stomach, the gastric douche has been recommended by

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[1] Beard and Rockwell: *l. c.*

Malbranc[1] and lately by Rosenheim.[2] In a few cases I have applied the gastric spray with similar good results. As regards medicaments, the bromides are of the greatest importance.

℞ Ammonii bromidi,
Sodii bromidi, ... āā 1.0
M. f. pulv. D. in chart. No. 20. S. One powder twice daily in milk or in water.

The use of the different tonics (iron, arsenic) is frequently indicated. Levico or Roncegno water (one-half to one tablespoonful three times daily), ferratin, Gude's peptomangan, Dietrich's peptonate of iron are also in place. In cases in which the anorexia plays a dominant part, tincture of nux vomica (ten drops three times daily) or orexinum basicum (2 dgm. in wafers, three times daily) should be administered. Insomnia will often have to be remedied by the use of either chloral hydrate, sulphonal (1½ to 2 gm.), or trional (1 to 2 gm.).

The bowels should be regulated according to the rules given in the chapter on chronic gastric catarrh. A sojourn in the mountains or in some watering-place having mild ferruginous springs, such as Elster, Franzensbad, and Pyrmont, or salines such as Ems, Wiesbaden, and Kissingen, may be recommended, while the purgative waters of Carlsbad and Marienbad should be avoided.

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[1] Malbranc: *l. c.*

[2] Th. Rosenheim: Therap. Monatshefte, 1892, p. 382.

CHAPTER XIV.

THE CONDITION OF THE STOMACH IN DISEASES OF OTHER ORGANS.

THERE are but few diseases which are not attended to a greater or less extent with gastric symptoms. Every constitutional or local disease, febrile and afebrile processes, are all more or less complicated with disturbances of the digestive organs. The digestive symptoms in all these conditions, however, are dependent upon a general disturbance of the entire organism and are not due to real affections of the digestive organs. They are therefore always discussed in the symptomatology of the different diseases. In the following we shall briefly describe the condition of the stomach in several organic diseases of other organs, wherein the gastric symptoms play a predominant part. In fact, in many cases it is quite difficult to recognize the secondary nature of the gastric trouble, the primary disease giving so few and unimportant symptoms that it is easily overlooked.

Tuberculosis of the Lungs.—As is well known, in pulmonary tuberculosis the symptoms of the gastro-intestinal tract are frequently very pronounced and very difficult to manage; often there exist loss of appetite, disagreeable sensations after meals, belching, bad taste, constipation alternating with diarrhœa, and last, but not least, severe and obstinate gastralgia as well as enteralgia. While these gastric symptoms, as a rule, appear when the tuberculous process in the lungs is already quite advanced, occasionally they may exist long before there is any evidence of a real lung trouble. While the pathological anatomy of the stomach in tuberculous patients has been examined by W. Fenwick,[1] who found well-marked evidence of gastric catarrh in eleven out of fifteen cases of phthisis, the functions of the stomach in this affection have been studied by Rosenthal,[2] Edinger,[3] Klemperer[4] and Schetty,[5] Brieger,[6] Hildebrandt,[7] Immermann,[8] and myself.[9] My own conclusions, which harmonize well with those of most of the writers just mentioned, were published in the *Medical Record* of May 4th, 1889, and are as follows:

1. Among the fifteen cases of phthisis pulmonum examined, free hydrochloric acid was absent in two only (Nos. 14 and 15); in a third patient (No. 11) the hydrochloric acid was wanting but once, and was present at two other examinations; in all the other patients the hydrochloric acid was always present.

2. As regards acidity, in five patients (Nos. 6 to 10) it was found normal; five (Nos. 1 to 5) showed hyperacidity; and five (Nos. 11 to 15), a diminution in the degree of acidity; among the last group there

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[1] W. Fenwick: Virchows' Arch., 1889, p. 187.

[2] C. Rosenthal: Berl. klin. Wochenschr., 1888, No. 45.

[3] Edinger: Deutsch. Arch. f. klin. Med., 1881.

[4] Klemperer: Berl. klin. Wochenschr., 1889, No. 11.

[5] F. Schetty: Deutsch. Arch. f. klin. Med., Bd. 44, p. 219.

[6] Brieger: Deutsch. med. Wochenschr., 1888, No. 14.

[7] Hildebrandt: *ibidem*, 1889, No. 15.

[8] Immermann: Verhandl. des Congresses f. innere Medicin Wiesbaden, 1889.

[9] Max Einhorn: Medical Record, May 4th, 1889.

were two with a total absence of free hydrochloric acid.

3. Only one patient (No. 4) had in his stomach, after the test breakfast, the remnants of the yolk of an egg which he had eaten on the day previous, and that but once. In all other patients no food whatever was found in the stomach except the fine pieces of the roll. The stomach must have been empty before taking the breakfast, and therefore it can be concluded that the motor power of the stomach was not diminished in a very high degree.

4. In most cases a record of the appetite was kept. *A priori*, one would be inclined to think that the appetite is in a certain degree dependent upon the amount of gastric juice secreted. As the amount of gastric juice secreted is measured by the degree of acidity, the appetite ought to be good where hyperacidity or a normal amount of acidity exists, and bad where there is present a diminished degree of acidity. But this is not true; three patients with hyperacidity (Nos. 1, 3, and 4), and two with normal acidity (Nos. 8 and 10), complained of poor appetite, whereas patient No. 15 had a good appetite, although there was complete absence of free hydrochloric acid in his stomach.

It will be seen that frequently the subjective symptoms do not harmonize with the objective data found in a thorough examination of the stomach. The point to be gained from this fact with regard to treatment is not to be afraid of giving sufficient food to these patients with markedly disturbed appetite and many other dyspeptic symptoms. In fact, gavage or forced alimentation will often prove very useful. Debove, Peiper, Leyden, and others have obtained the most beneficial results in phthisical patients by this method.

The treatment of the gastric symptoms, in which certain functional anomalies of the stomach (as for instance hyperchlorhydria or hypochlorhydria) have been found, will be similar to that described under the head of these latter conditions. The main treatment, however, must always be directed against the primary affection, namely, the lung trouble.

Tuberculous ulcers of the stomach are occasionally met with, especially in association with tuberculous lesions of other organs. Their occurrence has been described by several writers (Eppinger,[1] Litten,[2] Musser[3]).

In *chlorosis* and *anœmia* the gastric symptoms frequently play an important part. They all, as a rule, belong to the neurotic derangements of the stomach. Thus anorexia, gastralgia, hyperæsthesia of the stomach, atony, and hyperchlorhydria are frequently met with. Some writers (Hayem[4] and others) look upon the gastric disturbances as the primary factor causing the affection of the blood. I concur with Ewald and Rosenheim that in the vast majority of cases the digestive symptoms are only sequelæ and not the primary cause of the chlorosis. The administration of iron quickly improves the gastric symptoms.

Heart lesions are frequently attended with gastric disturbances. The latter, as a rule, are due to hyperæmia of the gastric mucosa and consist in a feeling of pressure in the epigastric region, especially after meals, anorexia, belching, etc. Huefler's[1] assertion that there is an absence of free hydrochloric acid in almost all cases of valvular heart lesions is not correct, as has been shown by myself[2] and later by Adler and Stern.[3] Among twelve patients with heart affections whose gastric contents I have examined, in eight free hydrochloric acid was present, while in four it was absent.

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[1] Eppinger: Prag. med. Wochenschr., 1881, Nos. 51 and 52.

[2] Litten: Virch. Arch., Bd. 67, p. 615.

[3] Musser: Philad. Hospital Reports, 1890, vol. 1, p. 170.

[4] Hayem: Bull. médical, 1891, No. 87.

Gastric affections not infrequently produce symptoms simulating a heart lesion. Thus, for instance, arhythmia cordis, tachycardia, and occasionally bradycardia are met with in chronic gastric catarrh, in nervous disorders, and in atony of the stomach. Sometimes it is difficult to decide at first whether we have to deal with an affection of the heart or of the stomach. A thorough examination of the circulatory apparatus and also of the gastric functions will reveal the true nature of the disease.

Like affections of the heart, *disturbances of the liver* are also almost always accompanied by gastric symptoms, due to a hyperæmic condition of the stomach. Thus in icterus and cirrhosis of the liver the stomach is the first to manifest various symptoms. Here, as in most other diseases, the secretory function of the stomach does not show any constancy; in some cases the gastric juice may be normal, in some increased, while in the greater number of cases it is diminished.

Diseases of the kidney are also frequently associated with gastric symptoms. Thus nausea and vomiting may be the first symptoms. They are caused either by excretion of urea through the gastric mucous membrane, or by the retention of that substance in the circulation and the irritation caused thereby upon the brain. Biernacki[1] has made a series of examinations of the gastric condition in renal affections and found that in most of them the gastric secretion was greatly diminished. Allen A. Jones[2] likewise frequently found achylia gastrica among patients with kidney troubles. Stone in the kidney may give rise to similar gastric disturbances. I have observed in a patient suffering with renal calculus, achylia gastrica which had existed for a long time, and given rise to many severe symptoms. After the removal of the stone by operation the gastric symptoms at once disappeared.

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[1] Huefler: München. med. Wochenschr., 1889, No. 33.

[2] Max Einhorn: Berl. klin. Wochenchr., 1889, No. 48.

[3] Adler und Stern: Berl. klin. Wochenschr., 1889, No. 49.

The condition of the stomach in *diabetes* has been examined by Rosenstein[3] and Gans.[4] The gastric functions were found very variable. I have had the opportunity of examining quite a number of diabetics with regard to the gastric functions and must say that they do not show any constancy. Normal and abnormal conditions of secretion are alike found.

In a case of chronic *arthritis deformans* and in two patients with severe *gout* I found achylia gastrica. In several instances in which only slight symptoms of gout existed, I frequently found hyperchlorhydria.

The existence of gastric symptoms in *malaria* is well known, and Leube[1] first described several cases of very severe gastralgia with absence of fever, which were due to malaria, as the successful treatment with quinine clearly proved. The malarial origin of the gastric symptoms will be apparent if they are intermittent and appear only at a certain time every day or every other day. I have observed several cases of obstinate vomiting due to malaria, but in most of these instances there have been, besides the gastric symptoms, other manifestations indicating the true nature of the condition. The gastric secretion here also does not show any characteristic feature, and is frequently diminished.

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[1] Biernacki: Berl. klin. Wochenschr., 1891, Nos. 25 and 26.

[2] Allen A. Jones: "Gastric Conditions in Renal Disease," New York Medical Journal, January 19th, 1895.

[3] Rosenstein: Berl. klin. Wochenschr., 1890, No. 13.

[4] Edg. Gans: IX. Congress f. innere Medicin, 1890, Wiesbaden.

Diseases of the Skin.—This subject, although of particular interest, has as yet received but very little attention. Pidoux[2] considered all cases of dyspepsia due to a herpetic state of the system. The appearance of eczema, psoriasis, pityriasis, lichen, or acne in any case he considered as outward manifestations of that constitutional anomaly which he called herpétisme. Nowadays no one will be inclined to accept this theory of a general constitutional anomaly for the origin of these troubles of the alimentary tract. Notwithstanding this there is no doubt that occasionally some connection is found between some skin manifestations and digestive disturbances.

Pemphigus of the mouth has been described under the name of stomatitis neurotica chronica by A. Jacobi,[3] of New York. I observed this affection present in three patients suffering from neurasthenia gastrica and hyperchlorhydria respectively. In two of these cases there was an improvement of the affection of the mouth (also tongue) in connection with the abatement of the gastric symptoms. In the third case, however, the pemphigus resisted every kind of treatment and persisted even during periods in which there were no complaints referring to digestion. In this case there were frequently present a burning sensation within the œsophagus and slight symptoms of dysphagia. Most probably they were also caused by the formation of vesicular patches along the œsophageal wall.

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[1] Leube: Deutsch. Arch. f. klin. Medicin, Bd. 33.

[2] Pidoux: "Rapport de l'herpétisme et des dyspepsies." L'Union médicale, 1866, p. 235.

[3] A. Jacobi: Transactions of the Association of American Physicians, 1894.

Urticaria and *erythema* due to absorption in the digestive tract of some poisonous substances ingested with the food (especially lobsters, soft-shell crabs, fish, and the like) are well known and have been referred to above under the head of idiosyncrasies.

With reference to *eczema* Hyde[1] says: "No one, however, can doubt for a moment that many visceral disorders have an influence upon the production of eczema, repeated attacks even following accesses of morbid affections of these organs; and it is equally certain that many varieties of eczema are directly dependent upon several systemic states such as, most effective in the list, gout and rheumatic gout, dyspepsia, constipation, and scrofula." Considering the large number of dyspeptics which come under my observation, I must say that the occurrence of eczema among them is very infrequent indeed. This would rather speak against an intimate connection between these two affections, although I have seen a case of eczema of the scrotum which had resisted the most rational methods of local treatment, in which the skin trouble very quickly disappeared after amelioration of the gastric symptoms.

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[1] Hyde: "Twentieth Century Practice of Medicine," vol. v., p. 170.

Acne simplex and *acne rosacea* seem to occur more frequently in connection with affections of the stomach than eczema. Two patients of mine with acne rosacea and chronic continuous gastric succorrhœa have both shown a decided improvement of the red nose after an amelioration of the gastric symptoms. In one of these patients I frequently noticed that the skin affection became worse as soon as there was an exacerbation of the gastric symptoms, but changed for the better upon improvement of the latter.

In some cases of psoriasis, accompanied by digestive disorders, I did not observe that the improvement in the latter condition exerted any direct influence upon the skin affection.

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